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# Experimental Studies in Spelling

To Determine Whether Continuous Repetition  
or Repetition After an Interval is More  
Effective in Memorizing

BY

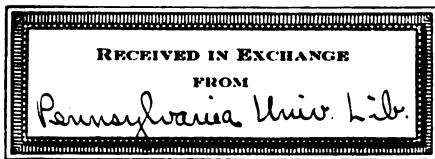
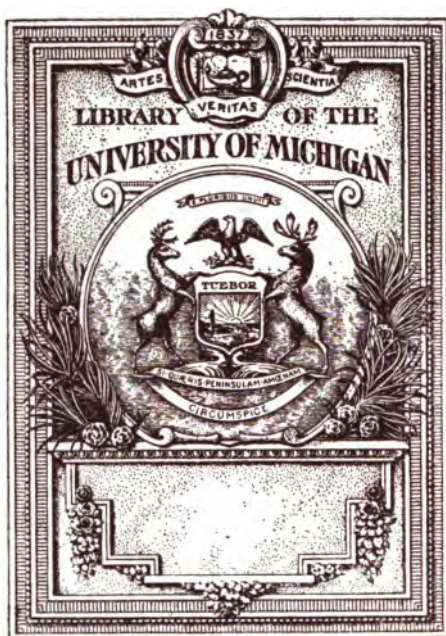
J. LINWOOD EISENBERG

A Thesis, presented to the Faculty of the Graduate School of  
the University of Pennsylvania, in partial fulfillment  
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Doctor of Philosophy.

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**J. LINCOLN FARRINGTON**

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EXPERIMENTAL STUDIES IN SPELLING TO DETERMINE  
WHETHER CONTINUOUS REPETITION OR REPETI-  
TION AFTER AN INTERVAL IS MORE EF-  
FECTIVE IN MEMORIZING.

AN INVESTIGATION COVERING A PERIOD OF YEARS  
FROM 1907 UNTIL 1912 CONDUCTED IN THE  
SCHOOLS UNDER MY SUPERVISION DURING  
THE YEARS NAMED.

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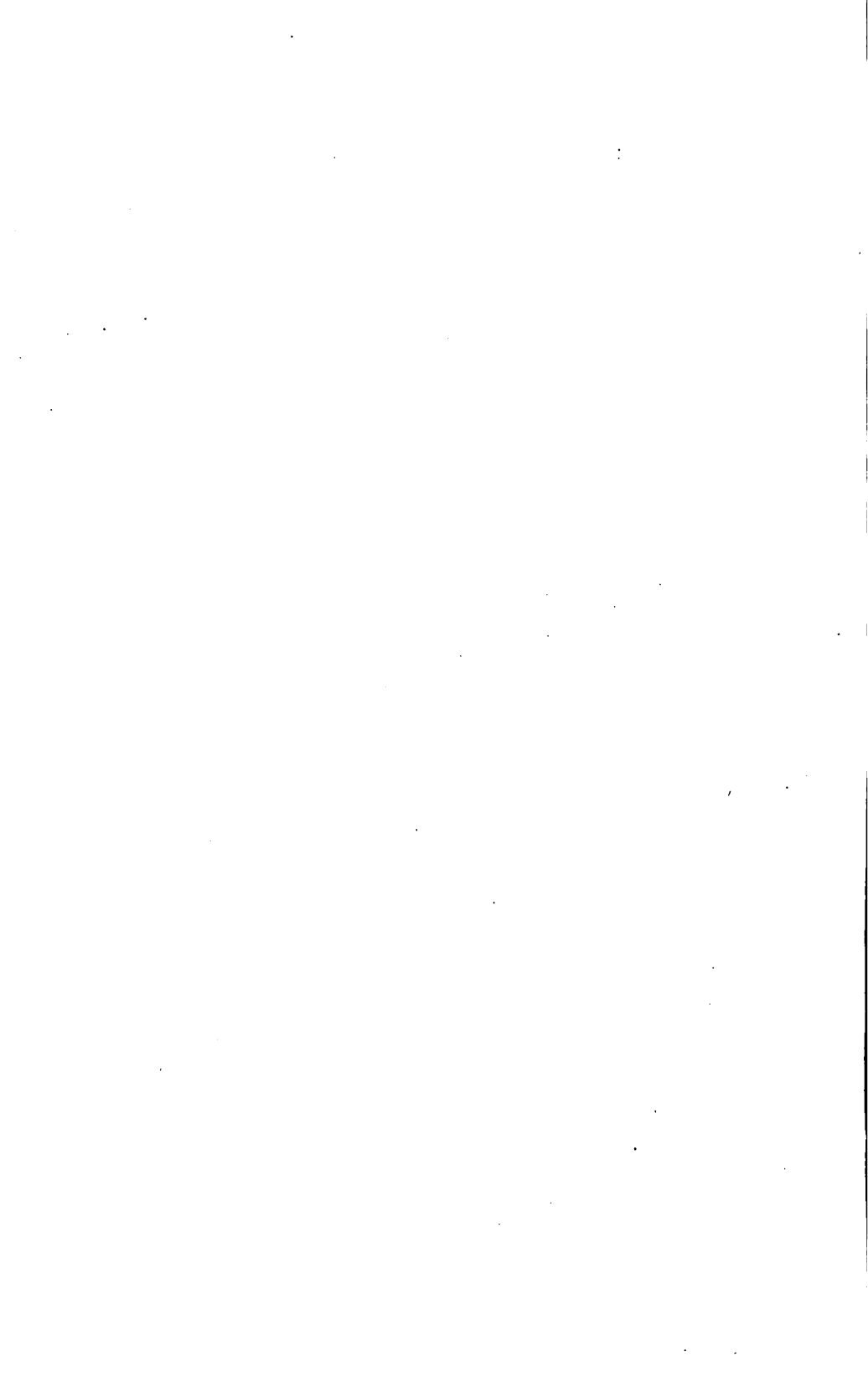
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## INTRODUCTION

This investigation is one of a series of investigations conducted under the direction of Dr. Yocum's Seminar in Pedagogy. The purpose of the investigation was to gather in a scientific way facts that would be helpful in determining a scientific method in Pedagogy.

In this particular investigation the object was to make all factors constant in memorizing spelling words except the form and number of repetitions. The tests were arranged in each case so that a comparison could be made between continuous repetitions and repetition after an interval, the number of repetitions being the same in both cases.



## GENERAL STATEMENT OF PLAN

Four different experiments were made. Three of the experiments formed a progressive series. The fourth was an individual experiment designed to see the effect upon the general results when the pupil studied only the words that were shown by the preliminary test to be unknown.

### EXPERIMENT I

Experiment I was conducted in the Royersford Public Schools with the aid of the teachers as noted in the specific plan of the experiment. The children of grades three to eight inclusive were used. All factors that would affect the results of memorizing were either eliminated or reduced to a constant in each test except the form of repetition. In Test A-1 all the factors were the same as A-2 except in A-1 the two repetitions were continuous and in A-2 one of the repetitions was after an interval the length of which was the time required to complete the list. In B-1 and B-2, the conditions were the same as A-1 and A-2, except that written repetition was used instead of the oral. This was the only place in all the experiments in which the written repetition was used. The written form was dropped because it made the problem more complex and because the time element was more difficult to control. The variation in time in this part of the experiment was greater than in any other part. The comparison of results for oral repetition was between Test A-1 and Test A-2; for written repetition, between Test B-1 and Test B-2.

### EXPERIMENT II

This experiment was conducted in the same general plan as Experiment I in regard to teachers, grade, and general procedure.

An effort was made to profit by the experiences in the first

experiment. The oral repetition was used entirely. The teacher had the words written on the board before the pupils came into the room. The words were kept covered until they were ready to be used in the study. This eliminated the possibility of some of the pupils seeing the teacher write the word on the board. It also made it possible to keep the time more nearly uniform.

In this experiment two series of tests were given; Series A with three tests, each of which had three oral repetitions, and Series B with five tests, each of which had four oral repetitions. The comparison of results was between the three tests of Series A, and between the five tests of Series B. The first test of Series A was characterized by three continuous repetitions. Both tests, two and three, were characterized by repetition after an interval as explained in the detail of the plan of the tests. In Series B, the first test was characterized by four continuous repetitions and tests two, three, four, and five were characterized by the same number of repetitions after an interval as explained in the detail of the plan of the tests.

### EXPERIMENT III

Experience in Experiments I and II made it evident that the experiments would be improved if one person performed the entire experiment. For this reason, I performed the experiment entirely myself.

It seemed desirable to have the experiment as nearly like the regular spelling lesson as possible. In order to do this, slips were printed containing the words used in the test as explained in the detail of the plan of the test.

A device was used to cover the words when not being studied. Pupils were taught to use the device before the tests were made so that the device would not disturb them in their study.

This experiment was made only in grades five to eight inclusive. This was done because the covering device seemed to be a disturbing factor in grades three and four. It was more difficult to control the time element. This was a factor in Experiments I and II. In Experiments III and IV, the time element was

made a constant, therefore, not a disturbing factor. This was done by practice. Experience made it possible to spend the same time in drill in each part of the test.

Three repetitions were used because it was found that a considerable number of the pupils learned all the words when four repetitions were made in the study.

Test I, the characteristic of which was three continuous repetitions, was given last in the series so that if any advantage was in favor of the last test of a series, it should be in favor of the test which did not show to advantage in Experiments I and II.

Tests II and III each had three repetitions after intervals as explained in the detail of the plan.

The results in this experiment are thought to be as nearly scientifically accurate as it is possible to have them. It is to be noted that the same general result was obtained as was obtained in Experiments I and II, but that the percentage in favor of repetition after an interval was higher in this experiment.

#### EXPERIMENT IV

This Experiment was conducted exactly as Experiment III except that individuals were used instead of groups of individuals. This was done so that each subject might spend the entire time in study of those words which were shown by the preliminary test to be unknown.

The pupils were especially selected for this experiment.\* The results simply serve to supplement the results of Experiments I, II, and III.

---

\* The selection of pupils was made in order to secure pupils of the same intelligence and power of attention. They all gave evidence of a high degree of learning power in Experiment III.



## GENERAL SUMMARY OF PRECAUTIONS

The purpose of the various precautions that were taken was either to eliminate or to make uniform all the factors affecting memorizing in spelling except repetition.

In all the experiments the tests were made before ten o'clock. This was done so that the pupils would not be fatigued at the time of the experiment.

By practice the experimenter learned to keep the time of study uniform or nearly so. There was some variation in Experiments I and II due to different experimenters and form of repetition. The time for each experimenter was uniform in the different tests. The written repetition required more time than the oral form. In Experiments III and IV, the time was uniform, due to one Experimenter.

The effort was made in each experiment to have the pupil study the words as directed. This was done by the different methods of covering the words when not being studied. In Experiment III this was done by a piece of cardboard, which proved to distract the attention less than the previous devices. By experience it was found that the pupils' attention was usually concentrated as directed without the use of the covering device.

In the first and second experiments the words were studied from the board. This was studying the word in a form different from the usual form of the spelling book. Hence, it was a disturbing factor, but constant in all the tests. In the third and fourth experiments, the words were in form similar to that of text from which the pupils were accustomed to study. This I considered much more satisfactory than the method of Experiments I and II.

In all the experiments a special effort was made to prevent any form of copying. This factor, I think, was entirely eliminated

from all of the tests. The papers of pupils who were especially poor spellers were rejected, hence all the tests represent pupils of average ability in spelling.

Tests one and two contain a disturbing factor in the form of different experimenters. In Experiments III and IV, this disturbing factor is entirely eliminated.

In Experiments I, II, and III, the time spent in study of the words was divided between words the pupils knew and words that the pupil had missed in the preliminary test. This, I felt, was a disturbing factor that could be eliminated by making a very large number of tests. Since this could not be done, I eliminated it by having each individual study only the words that he did not know.

The method of correcting the papers was practically uniform in all the tests. In Experiments I and II, different people corrected the lists. In Experiments III and IV, this was done immediately under my direction.

The details of precautions taken will be found in connection with each experiment.

## PART I

### EXPERIMENT I

The object of the following experiment was to determine whether continuous repetition or repetition after an interval is more effective in memorizing. The subject of Spelling was chosen because it was comparatively easy to eliminate all the factors in memorizing except repetition.

The experiment was made carefully as follows:

1. The tests were made in grades three (3) to eight (8) inclusive. All the tests were made between nine (9) and ten (10) o'clock in the morning. The object of having the tests at this time was that the children would be fresh and would take up the tests with equal freshness each time.

2. Twenty (20) words were given in each test. These words were selected as rather difficult for the grade so that there would be a rather large number of words to be learned in each test. All preliminary tests were made so that there would be a means of discovering the exact number of words that each pupil learned in the test.

3. Four (4) tests were made, making two (2) sets of comparison possible. The tests were numbered, A-1 and A-2; B-1 and B-2. These tests were so arranged that comparisons could be made between A-1 and A-2, B-1 and B-2. All factors remained constant in A-1 and A-2 excepting the method of repetition. The following directions were given in each test:

A-1.—1. The teacher was instructed to dictate words to class, pronouncing each word once, distinctly, being careful not to pronounce the word so slowly that it was equal to spelling the word for the pupil, but to pronounce it clearly as in ordinary conversation. Immediately after the list was dictated to the class the papers were collected. Later these papers were cor-

rected and a record made of the number of words missed previous to the study of the words by the pupils.

2. Immediately after the collection of the papers the teacher was to write the first word in the list on the board, pronounce it and have the pupils pronounce the word in concert.

3. The pupils immediately after pronouncing the words, were to spell or sound out the word twice, according to the method used by the teachers in teaching spelling.

4. The teacher was to erase word and proceed to the next word in the same way until the list was completed.

5. After the study of the entire list, the teacher was to pronounce the words to the class and have the pupils exchange papers and mark the words that were missed. The teacher was to spell the words for the pupils and have the pupils mark those which were missed. The teacher was to be sure that the corrections were made accurately. The papers were to be collected immediately after their correction.

A-2.—1. The teacher was instructed to dictate words to class, pronouncing each word once, distinctly, being careful not to pronounce the word so slowly that it was equal to spelling the word for the pupil, but to pronounce it clearly as in ordinary conversation. Immediately after the list was dictated to the class the papers were collected. Later these papers were corrected and a record made of the number of words missed previous to the study of the words by the pupils.

2. Immediately after collection of the papers the teacher was to write the first word in the list on the board, pronounce it and have the pupils pronounce the word in concert.

3. The pupils immediately after pronouncing were to spell or sound out the word once, according to the method used by teacher in teaching spelling.

4. The teacher was to cover the word with a piece of card board and proceed with the next word in the same way until the list was completed.

5. The teacher was to uncover the first word of the list and have the pupils spell or sound it out the second time, then erase the first word and proceed in the same way with the next word until the list was completed.

6. After the study of the entire list, the teacher was to pronounce the words to the class and have the pupils exchange papers and mark the words that were missed. The teacher was to spell the words for the pupils and have the pupils mark those which were missed. The teacher was to be sure that the corrections were made accurately. The papers were to be collected immediately after their correction.

B-1.—1. The teacher was instructed to dictate words to class, pronouncing each word once, distinctly, being careful not to pronounce the word so slowly that it was equal to spelling the word for the pupil, but to pronounce it clearly as in ordinary conversation. Immediately after the list was dictated to the class, the papers were collected. Later these papers were corrected and a record made of the number of words missed previous to the study of the words by the pupils.

2. Immediately after collection of the papers the teacher was to write the first word in the list on the board, pronouncing it and have the pupils pronounce the word in concert.

3. The pupils were to write the word twice and cover the words, immediately after being written twice, with a piece of cardboard.

4. The teacher was to erase word and proceed to the next word in the same way until the list was completed.

5. After the study of the entire list the teacher was to pronounce the words to the class and have the pupils exchange papers and mark the words that were missed. The teacher was to spell words for the pupils and have those marked that were missed. The teacher was to be sure that the corrections were made accurately. Papers were to be collected immediately after their correction.

B-2.—1. The teacher was instructed to dictate words to class, pronouncing each word once, distinctly, being careful not to pronounce the words so slowly that it was equal to spelling the word for the pupil, but to pronounce it clearly as in ordinary conversation. Immediately after the list was dictated to the class the papers were collected. Later these papers were corrected and a record made of the number of words missed previous to the study of the words by the pupils.

2. Immediately after collection of the papers the teacher was to write the first word in the list on the board, pronouncing it and have the pupils pronounce the word in concert.

3. The pupils were to write the word once and cover the word just written with a piece of cardboard.

4. The teacher was to cover the word and proceed with the next word in the same way until the list was completed.

5. Then the teacher was to uncover the first word and have the pupils write the word a second time, erase the first word and proceed with the next word in the same way until the list was completed.

4. All tests were made between nine (9) and ten (10) o'clock A. M.

5. The weather conditions were noted in each test.

6. The length of time spent in study of the words in each test was kept. The time for A-1 should be the same as for A-2; for B-1 the same as for B-2.

7. The papers of each pupil who was not present for all the tests and the papers of children decidedly abnormal in spelling were not considered in the test.

8. Each list of words was pronounced at the end of a week and the papers corrected as before. This was done with the idea of showing the permanency of results.

9. A record was made of the number of words missed the first time the words were pronounced, the number missed after the study of the words and the number missed at the end of the week. This record was made for each test. The number of words learned in the study, i. e. the number missed before the study less the number missed after the study divided by the number missed before the study gives the per cent of words learned. A comparison of per cent of words learned in A-1 with A-2 gives the result of the test; of B-1 with B-2 gives the result of the second part of the test. The results for the end of the week were obtained by dividing the number learned for at least a week, i. e. the number missed before the study less the number missed at the end of the week, by the number missed before the study.

TABLE I

*Males, Immediately After Study*

TEST A-1—Two oral repetitions—continuous.

	Number of Pupils.	Number of Words Missed Before Study	Number of Words Missed After Study	Number of Words Learned	Percentage of Words Learned
Grade III.....	29	368	212	156	43
Grade IV.....	23	279	138	141	50
Grade V.....	10	96	30	66	68
Grade VI.....	15	139	53	86	62
Grade VII.....	17	95	26	69	73
Grade VIII.....	14	104	14	90	86

TEST A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	29	309	167	142	46
Grade IV.....	23	219	115	104	47
Grade V.....	10	101	38	63	62
Grade VI.....	15	111	30	81	73
Grade VII.....	17	119	47	72	60
Grade VIII.....	14	78	10	68	87

The weather was clear for the tests in A-1 and A-2.

The time required for all the tests was the same excepting the following: Grade VI A-1,  $\frac{1}{2}$  min. less than same grade A-2; Grade VIII A-1,  $\frac{1}{2}$  min. less than same grade A-2.

The average time was 6 min.

*Females, Immediately After Study*

TEST A-1—Two oral repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number of Words Missed After Study	Number of Words Learned	Percentage of Words Learned
Grade III.....	28	336	179	157	47
Grade IV.....	24	220	68	152	69
Grade V.....	20	143	25	118	83
Grade VI.....	16	132	32	100	76
Grade VII.....	23	123	22	101	81
Grade VIII.....	10	61	5	56	92

TEST A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	28	347	148	199	57
Grade IV.....	24	173	56	117	68
Grade V.....	20	142	32	111	77
Grade VI.....	16	117	10	107	92
Grade VII.....	23	172	49	123	72
Grade VIII.....	10	40	1	39	98

The weather and the time conditions were the same as males, Table I.

*Total, Immediately After Study*

TEST A-1—Two oral repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number of Words Missed After Study	Number of Words Learned	Percentage of Words Learned
Grade III.....	57	704	391	313	44
Grade IV.....	47	499	206	293	60
Grade V.....	30	239	55	184	76
Grade VI.....	31	271	85	186	69
Grade VII.....	40	218	48	170	77
Grade VIII.....	24	165	19	146	88

TEST A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	57	656	315	341	52
Grade IV.....	47	392	171	221	57
Grade V.....	30	243	70	173	70
Grade VI.....	31	228	40	188	83
Grade VII.....	40	291	96	195	67
Grade VIII.....	24	118	11	107	93

Weather and time conditions same as males.



TABLE II

*Males, Immediately After Study*

TEST B-1—Two written repetitions—continuous.

	Number of Pupils.	Number of Words Missed Before Study	Number of Words Missed After Study	Number of Words Learned	Percentage of Words Learned
Grade III.....	29	159	173	*-14	*-9
Grade IV.....	23	253	155	98	39
Grade V.....	10	86	37	49	57
Grade VI.....	15	128	36	92	72
Grade VII.....	17	81	26	55	68
Grade VIII.....	14	57	3	54	95

TEST B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	29	389	191	198	51
Grade IV.....	23	281	144	137	48
Grade V.....	10	75	15	60	80
Grade VI.....	15	106	24	82	77
Grade VII.....	17	89	29	60	68
Grade VIII.....	14	69	13	56	82

The weather was clear for tests B-1 and B-2.

The time required for all the tests was practically the same, with the following exceptions: Grade IV B-1, 1 min. more than B-2; Grade VII and VIII B-1,  $\frac{1}{2}$  min. less than same grades B-2. The average time was  $9\frac{1}{3}$  min.

The time required for Grades III and IV was longer than the time for other grades because of taking more time to write the words.

*Females, Immediately After Study*

TEST B-1—Two written repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number of Words Missed After Study	Number of Words Learned	Percentage of Words Learned
Grade III.....	28	350	96	254	73
Grade IV.....	123	255	61	194	76
Grade V.....	20	150	34	116	77
Grade VI.....	16	119	21	98	82
Grade VII.....	23	104	27	77	74
Grade VIII.....	10	30	2	28	93

\* More words missed after the study than were missed before the study.

TEST B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	28	417	137	280	67
Grade IV.....	24	145	45	100	68
Grade V.....	20	124	8	116	93
Grade VI.....	16	113	12	101	90
Grade VII.....	23	106	9	97	91
Grade VIII.....	10	32	3	29	90

The weather and the time conditions same as males, Table II.

*Total, Immediately After Study*

TEST B-1—Two written repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number of Words Missed After Study	Number of Words Learned	Percentage of Words Learned
Grade III.....	57	509	269	240	45
Grade IV.....	47	508	216	292	58
Grade V.....	30	236	71	165	69
Grade VI.....	31	247	57	190	77
Grade VII.....	40	185	53	132	71
Grade VIII.....	24	87	5	82	94

TEST B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	57	806	328	478	59
Grade IV.....	47	426	189	237	58
Grade V.....	30	199	23	176	87
Grade VI.....	31	219	36	183	84
Grade VII.....	40	195	38	157	81
Grade VIII.....	24	101	16	85	86

The weather and the time conditions same as males, Table II.

TABLE III

*Males, at End of Week*

TEST A-1—Two oral repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number Missed at End of Week	Number of Words Retained	Percentage of Words Learned at End of Week
Grade III.....	29	368	260	108	30
Grade IV.....	23	279	177	102	36
Grade V.....	10	96	48	48	50
Grade VI.....	15	139	68	71	51
Grade VII.....	17	95	75	20	21
Grade VIII.....	14	104	36	68	65

TEST A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	29	309	233	76	25
Grade IV.....	23	219	159	60	27
Grade V.....	10	101	57	44	44
Grade VI.....	15	111	58	53	47
Grade VII.....	17	119	72	47	40
Grade VIII.....	14	78	31	47	61

Weather was clear in each case.

As there was no time spent in study the time was not noted.

*Females, at End of Week*

TEST A-1—Two oral repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number of Words Missed at End of Week	Number of Words Retained	Percentage of Words Learned at End of Week
Grade III.....	28	336	266	70	21
Grade IV.....	24	220	85	135	62
Grade V.....	20	143	39	104	73
Grade VI.....	16	132	44	88	66
Grade VII.....	23	123	46	77	62
Grade VIII.....	10	61	28	33	54

TEST A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	28	347	208	139	40
Grade IV.....	24	173	108	65	38
Grade V.....	20	142	58	84	60
Grade VI.....	16	117	47	70	60
Grade VII.....	23	172	65	107	63
Grade VIII.....	10	40	14	26	65

Weather and time conditions same as for males.

*Total, at End of Week*

TEST A-1—Two oral repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number Missed at End of Week	Number of Words Retained	Percentage of Words Learned at End of Week
Grade III.....	57	704	526	178	26
Grade IV.....	47	499	262	237	49
Grade V.....	30	239	87	152	62
Grade VI.....	31	271	112	159	59
Grade VII.....	40	218	121	97	41
Grade VIII.....	24	165	64	101	60

TEST A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	57	656	441	215	33
Grade IV.....	47	392	267	125	33
Grade V.....	30	243	115	128	53
Grade VI.....	31	228	105	123	54
Grade VII.....	40	291	137	154	52
Grade VIII.....	24	118	45	73	63

Weather and time conditions same as for males.

TABLE IV

*Males, at End of Week*

TEST B-1—Two written repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number Missed at End of Week	Number of Words Retained	Percentage of Words Learned at End of Week
Grade III.....	29	159	241	*-82	*-51
Grade IV.....	23	253	194	59	24
Grade V.....	10	86	49	37	43
Grade VI.....	15	128	55	73	56
Grade VII.....	17	81	75	6	8
Grade VIII.....	14	57	17	40	71

TEST B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	29	289	261	128	51
Grade IV.....	23	281	195	86	30
Grade V.....	10	75	36	39	51
Grade VI.....	15	106	51	55	51
Grade VII.....	17	89	62	27	30
Grade VIII.....	14	69	27	42	61

Weather was clear in each case.

As there was no time spent in study the time was not noted.

*Females, at End of Week*

TEST B-1—Two written repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number Missed at End of Week	Number of Words Retained	Percentage of Words Learned at End of Week
Grade III.....	28	350	234	116	33
Grade IV.....	24	255	120	135	53
Grade V.....	20	150	50	100	67
Grade VI.....	16	119	43	76	63
Grade VII.....	23	104	54	50	48
Grade VIII.....	10	30	5	25	83

\* Number of words missed at end of the week was greater than in preliminary test.

TEST B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	28	417	252	165	40
Grade IV.....	24	145	130	15	10
Grade V.....	20	124	42	82	66
Grade VI.....	16	113	50	63	56
Grade VII.....	23	106	42	64	61
Grade VIII.....	10	32	10	22	47

Weather and time conditions same as for males, Table IV.

*Total, at End of Week*

TEST B-1—Two written repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number Missed at End of Week	Number of Words Retained	Percentage of Words Learned at End of Week
Grade III.....	57	509	475	34	9
Grade IV.....	47	508	314	194	39
Grade V.....	30	236	99	137	55
Grade VI.....	31	247	98	159	60
Grade VII.....	40	185	129	56	30
Grade VIII.....	24	87	22	65	75

TEST B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	57	806	513	293	46
Grade IV.....	47	426	325	101	23
Grade V.....	30	199	78	121	59
Grade VI.....	31	219	101	118	55
Grade VII.....	40	195	104	91	46
Grade VIII.....	24	101	37	64	64

Weather and time conditions same as for males, Table IV.

TABLE V

*Males, Immediately After Study*

TEST A-1—Two oral repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number of Words Missed After Study	Average Number of Words Learned	Percentage of Words Learned
Grade III.....	29	12.7	7.3	5.4	43
Grade IV.....	23	12.1	6.	6.1	50
Grade V.....	10	9.6	3.	6.6	68
Grade VI.....	15	9.2	3.5	5.7	62
Grade VII.....	17	5.5	1.5	4.	73
Grade VIII.....	14	7.4	1.	6.4	86

TEST A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	29	16.5	5.8	10.7	46
Grade IV.....	23	9.5	5.	4.5	47
Grade V.....	10	10.1	3.8	6.3	62
Grade VI.....	15	7.4	2.	5.4	73
Grade VII.....	17	7.	2.8	4.2	60
Grade VIII.....	14	5.6	.7	4.9	87

*Females, Immediately After Study*

TEST A-1—Two oral repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number of Words Missed After Study	Average Number of Words Learned	Percentage of Words Learned
Grade III.....	28	12.	6.1	5.9	47
Grade IV.....	24	9.1	2.8	6.2	69
Grade V.....	20	7.2	1.3	5.9	83
Grade VI.....	16	9.2	2.	7.2	76
Grade VII.....	23	5.3	1.	4.3	81
Grade VIII.....	10	6.1	.5	5.6	92

TEST A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	28	12.4	5.3	7.1	57
Grade IV.....	24	7.2	2.3	4.9	68
Grade V.....	20	7.1	1.6	5.5	77
Grade VI.....	16	7.3	.6	6.7	92
Grade VII.....	23	7.5	2.1	5.4	72
Grade VIII.....	10	4.0	.1	3.9	98

*Total, Immediately After Study*

TEST A-1—Two oral repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number of Words Missed After Study	Average Number of Words Learned	Percentage of Words Learned
Grade III.....	57	12.4	6.7	5.7	44
Grade IV.....	47	10.6	4.4	6.2	60
Grade V.....	30	8.4	2.2	6.8	76
Grade VI.....	31	9.2	2.7	6.5	69
Grade VII.....	40	5.4	1.3	4.1	77
Grade VIII.....	24	6.8	.8	6.	88

TEST A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	57	14.5	5.6	8.9	52
Grade IV.....	47	8.4	3.7	4.7	58
Grade V.....	30	8.6	2.7	5.9	70
Grade VI.....	31	7.4	1.3	6.1	83
Grade VII.....	40	7.3	2.5	4.8	67
Grade VIII.....	24	4.8	.4	4.4	93

TABLE VI

*Males, Immediately After Study*

TEST B-1—Two written repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number of Words Missed After Study	Average Number of Words Learned	Percentage of Words Learned
Grade III.....	29	5.5	6.	*-.5	*-9
Grade IV.....	23	11.	6.7	4.3	39
Grade V.....	10	8.6	3.7	4.9	57
Grade VI.....	15	8.5	2.4	6.1	72
Grade VII.....	17	4.8	1.5	3.3	68
Grade VIII.....	14	4.1	.2	3.9	95

\* More words were missed after study than before the study.



TEST B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	29	13.4	6.6	6.8	51
Grade IV.....	23	12.2	6.3	5.9	48
Grade V.....	10	7.5	1.5	6.	80
Grade VI.....	15	7.1	1.6	5.5	77
Grade VII.....	17	5.2	1.6	3.6	68
Grade VIII.....	14	4.9	.9	4.	82

*Females, Immediately After Study*

TEST B-1—Two written repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number of Words Missed After Study	Average Number of Words Learned	Percentage of Words Learned
Grade III.....	28	12.5	3.4	9.1	73
Grade IV.....	24	10.6	2.5	8.1	76
Grade V.....	20	7.5	1.7	5.8	77
Grade VI.....	16	7.4	1.3	6.1	82
Grade VII.....	23	4.3	1.2	3.1	74
Grade VIII.....	10	3.	.2	2.8	93

TEST B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	28	15.	4.9	10.1	67
Grade IV.....	24	6.	1.9	4.1	68
Grade V.....	20	6.2	.4	5.8	93
Grade VI.....	16	7.1	.7	6.4	90
Grade VII.....	23	4.6	.4	4.2	91
Grade VIII.....	10	3.2	.3	2.9	90

*Total, Immediately After Study*

TEST B-1—Two written repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number of Words Missed After Study	Average Number of Words Learned	Percentage of Words Learned
Grade III.....	57	9.	4.7	4.3	32
Grade IV.....	47	10.8	4.6	6.2	58
Grade V.....	30	8.1	2.7	5.9	69
Grade VI.....	31	7.9	1.9	6.1	77
Grade VII.....	40	4.6	1.4	3.2	71
Grade VIII.....	24	3.6	.2	3.4	94

TEST B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	57	14.2	5.8	8.5	59
Grade IV.....	47	9.1	4.1	5.	58
Grade V.....	30	6.9	1.	5.9	87
Grade VI.....	31	7.1	1.2	6.	84
Grade VII.....	40	4.8	1.	3.9	81
Grade VIII.....	24	4.1	.6	3.5	86

TABLE VII

*Males, at End of Week*

TEST A-1—Two oral repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number Missed at End of Week	Average Number Learned at End of Week	Percentage of Words Learned at End of Week
Grade III.....	29	12.7	8.9	3.8	30
Grade IV.....	23	12.1	7.7	4.4	36
Grade V.....	10	9.6	4.8	4.8	50
Grade VI.....	15	9.2	4.5	4.7	51
Grade VII.....	17	5.5	4.4	1.1	21
Grade VIII.....	14	7.4	2.6	4.8	65

TEST A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	29	16.5	8.	8.5	25
Grade IV.....	23	9.5	6.9	2.6	27
Grade V.....	10	10.1	5.7	4.4	44
Grade VI.....	15	7.4	3.9	3.5	47
Grade VII.....	17	7.	4.2	2.8	40
Grade VIII.....	14	5.6	2.2	3.4	61

*Females, at End of Week*

TEST A-1—Two oral repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number Missed at End of Week	Average Number Learned at End of Week	Percentage Learned at End of Week
Grade III.....	28	12.	9.5	2.5	21
Grade IV.....	24	9.1	3.5	5.6	62
Grade V.....	20	7.2	1.9	5.3	73
Grade VI.....	16	9.2	2.8	6.4	66
Grade VII.....	23	5.3	2.	3.3	54
Grade VIII.....	10	6.1	2.8	3.3	54

TEST A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	28	12.4	7.4	5.	40
Grade IV.....	24	7.2	4.5	2.7	38
Grade V.....	20	7.1	2.9	4.2	60
Grade VI.....	16	7.3	2.9	4.4	60
Grade VII.....	23	7.5	2.8	4.7	63
Grade VIII.....	10	4.	1.4	2.6	65

*Total, at End of Week*

TEST A-1—Two oral repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number Missed at End of Week	Average Number Learned at End of Week	Percentage Learned at End of Week
Grade III.....	57	12.4	9.2	3.2	26
Grade IV.....	47	10.6	5.6	5.	49
Grade V.....	30	8.4	3.3	5.1	62
Grade VI.....	31	9.2	3.7	5.5	59
Grade VII.....	40	5.4	3.2	2.2	41
Grade VIII.....	24	6.8	2.7	4.1	60

TEST A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	57	14.5	7.7	6.8	33
Grade IV.....	47	8.4	5.7	2.7	33
Grade V.....	30	8.6	4.3	4.3	53
Grade VI.....	31	7.4	3.4	4.	54
Grade VII.....	40	7.3	3.5	3.8	52
Grade VIII.....	24	4.8	1.8	3.	63

TABLE VIII

*Males, at End of Week*

TEST B-1—Two written repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number Missed at End of Week	Average Number Learned at End of Week	Percentage of Words Learned at End of Week
Grade III.....	29	5.5	8.3	*-2.8	*-51
Grade IV.....	23	11.	8.4	2.6	24
Grade V.....	10	8.6	4.9	3.7	43
Grade VI.....	15	8.5	3.7	4.8	56
Grade VII.....	17	4.8	4.4	.4	8
Grade VIII.....	14	4.1	1.2	2.9	71

\* More words were missed at the end of week than were missed before study.

TEST B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	29	13.4	9.	4.4	51
Grade IV.....	23	12.2	8.5	3.7	30
Grade V.....	10	7.5	3.6	3.9	51
Grade VI.....	15	7.1	3.4	3.7	52
Grade VII.....	17	5.2	3.6	1.6	30
Grade VIII.....	14	4.9	1.9	3.	61

*Females, at End of Week*

TEST B-1—Two written repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number Missed at End of Week	Average Number Learned at End of Week	Percentage of Words Learned at End of Week
Grade III.....	28	12.5	8.4	4.1	33
Grade IV.....	24	10.6	5.	5.6	53
Grade V.....	20	7.5	2.5	5.	67
Grade VI.....	16	7.4	2.7	4.7	63
Grade VII.....	23	4.3	2.3	2.	48
Grade VIII.....	10	3.	.5	2.5	83

TEST B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	28	15.	9.	6.	40
Grade IV.....	24	6.	5.4	.6	10
Grade V.....	20	6.2	2.1	4.1	66
Grade VI.....	16	7.1	3.1	4.	56
Grade VII.....	23	4.6	1.8	2.8	61
Grade VIII.....	10	3.2	1.	2.2	47

*Total, at End of Week*

TEST B-1—Two written repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number Missed at End of Week	Average Number Learned at End of Week	Percentage of Words Learned at End of Week
Grade III.....	57	9.	8.4	.6	7
Grade IV.....	47	10.8	6.7	4.1	39
Grade V.....	30	8.1	3.7	4.4	35
Grade VI.....	31	7.9	3.2	4.7	60
Grade VII.....	40	4.6	3.4	1.2	30
Grade VIII.....	24	3.6	.9	2.7	75

TEST B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

Grade III.....	57	14.2	9.	5.2	46
Grade IV.....	47	9.1	6.9	2.2	23
Grade V.....	30	6.9	2.9	4.	59
Grade VI.....	31	7.1	3.3	3.8	55
Grade VII.....	40	4.8	2.7	2.1	46
Grade VIII.....	24	4.1	15.	2.6	64

TABLE IX

COMPARISON OF TEST A-1 AND A-2—A-1—Two oral repetitions—continuous;  
A-2—Two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

	Number of Pupils	Percent. Learned Immediately After Study		Percent. Learned at End of Week	
		A-1	A-2	A-1	A-2
Males					
Grade III.....	29	43	46	30	25
Grade IV.....	23	50	47	36	27
Grade V.....	10	68	62	50	44
Grade VI.....	15	62	73	51	47
Grade VII.....	17	73	60	21	40
Grade VIII.....	14	86	87	65	61
Females					
Grade III.....	28	47	57	21	40
Grade IV.....	24	69	68	62	38
Grade V.....	20	83	77	73	60
Grade VI.....	16	76	92	66	60
Grade VII.....	23	81	72	62	63
Grade VIII.....	10	92	98	54	65
Total					
Grade III.....	57	44	52	26	33
Grade IV.....	47	60	58	49	33
Grade V.....	30	76	70	62	53
Grade VI.....	31	69	83	59	54
Grade VII.....	40	77	67	41	52
Grade VIII.....	24	88	93	60	63
Average .....	..	69	49.5	70.5	48

TABLE X

COMPARISON OF TEST B-1 AND B-2—B-1—Two written repetitions—continuous; B-2—Two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

	Number of Pupils	Percent. Learned Immediately After Study		Percent. Learned at End of Week	
		B-1	B-2	B-1	B-2
<i>Males</i>					
Grade III.....	29	—9	51	—51	51
Grade IV.....	23	39	48	24	30
Grade V.....	10	57	80	43	51
Grade VI.....	15	72	77	56	52
Grade VII.....	17	68	68	8	46
Grade VIII.....	14	95	82	71	61
<i>Females</i>					
Grade III.....	28	73	67	33	40
Grade IV.....	24	76	68	53	10
Grade V.....	20	77	93	67	66
Grade VI.....	16	82	90	63	56
Grade VII.....	23	74	91	48	61
Grade VIII.....	10	93	90	83	47
<i>Total</i>					
Grade III.....	57	32	59	—9	46
Grade IV.....	47	58	58	39	23
Grade V.....	30	69	87	55	59
Grade VI.....	31	77	84	60	55
Grade VII.....	40	71	81	30	46
Grade VIII.....	24	94	86	75	64
<i>Average.....</i>	..	66.8	41.5	75.8	48.8

ANALYSIS OF TEST A-1 AND A-2.

Examination of results shows that Grades 4, 5, and 7 learned the largest percentage of words in Test A-1, two oral repetitions—continuous and that Grades 3, 6, and 8 learned the largest percentage of words in A-2—two oral repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

The average percentage of words learned in the six grades in Test A-1 is 69 per cent; in A-2 is 70.5 per cent, making 1.5 per cent in favor of A-2, the characteristic of which was repetition after an interval. In general the result was the same at the end of the week.

#### ANALYSIS OF TEST B-1 AND B-2

Examination of results shows that Grade 8 learned the largest percentage of words in Test B-1—two written repetitions—continuous and that Grade 4 learned the same percentage in B-1 and B-2. Grades 3, 5, 6, and 7 learned a larger percentage of words in B-2—two written repetitions—one repetition after an interval the length of which was the time required to study the other words of the list.

The average percentage of words learned in the six grades in Test B-1 is 66.8 per cent; in B-2, 75.8 per cent, making 9 per cent in favor of B-2, the characteristic of which was repetition after an interval. B-2 differed from A-2 in form of repetition, B-2 being written repetition. In general the result was the same at the end of the week.

In both parts of this experiment, the final average points very clearly to repetition after an interval as being more effective in memorizing, although, especially in Tests A-1 and A-2, there are individual exceptions in certain grades.

## PART II

### EXPERIMENT II

The purpose of this experiment was the same as Experiment in Part I.

The plan of the experiment as used in Part I was modified as follows: Experience as gained in Part I made it evident that it would be desirable to have one person conduct the entire experiment. Hence, I concluded to conduct the experiment entirely myself, not having the teachers assist me in any way. This plan I found impracticable for the following reasons:

1. It required more time than I could give to it to conduct the experiment in the different grades.
2. The change in hand writing from that of teacher was a disturbing factor. This could be avoided by the teacher writing the words on the board.
3. The grades being located in two buildings, it was impossible to conduct the test on the same day. Not doing it on the same day, pupils of the same grade would talk about the test and thus make a disturbing factor that would largely invalidate results.

Another plan considered was to have pupils study an advance lesson in the book instead of writing words on the board. This would have the very great advantage of being similar to the preparation of the ordinary spelling lesson.

The objections to this are: (1). No way to be certain that pupils study as directed. (2). Not likely to have maximum of attention.

The following plan was used in this test:

1. The test was made in grades 3, 4, 5, 6, 7, and 8.
2. Twenty words in each test were selected so that there was a large number of words to be learned by the class.
3. All the tests were made at the same time of the day between 8:45 and 10:00 A. M. This was done so as to have as nearly as possible the same mental condition.



4. The weather conditions were noted as clear, fair, or cloudy. As the test was conducted in February and March, the temperature being uniform in the rooms, the temperature was not a factor. If conducted in Spring or Fall the temperature would be noted, as it would be a disturbing factor.

5. Any pupil especially abnormal as to spelling was not counted in this test. They took the work with the class, but papers were rejected in results. The same was done with respect to pupils that were not in good physical condition at the time of the test.

6. The length of time spent in study of words in each test was noted. This time should not vary more than half a minute. By careful trial the time for each test in Series I was shown to be practically the same. The same was true of Series 2.

7. Only the papers for pupils present for all tests in Series I were considered. The same was true for Series 2.

8. The same list of words was pronounced at the end of a week. This was called the Review.

9. The teachers of the grades pronounced the words of the tests to the class according to the following directions. All papers were corrected under my immediate direction.

10. The results were recorded as follows: A record was made of the words missed in the preliminary test, of the number missed after the study, and the number missed at the end of the week. The number missed in the preliminary test less the number missed after study was the number learned. The number learned divided by the number possible to be learned, *i. e.*, number missed after preliminary test, gave the percentage learned.

Objection—The device was likely to be a disturbing factor. I would suggest that this device could be dispensed with. Upon trial I believe the pupils will concentrate on the word as directed by pointing to it without covering with device.

#### *Plan of Tests*

Make tests immediately after opening exercises. Words to be written on board before pupils come into room and covered until ready to study words.

*Series A—Test I*

1. Dictate words to class. Collect papers immediately.
2. (a) Experimenter pronounce the word.  
(b) Pupils pronounce and spell the word in concert.  
(c) Pronounce and spell the word in concert.  
(d) Pronounce and spell the word in concert.
3. Study each succeeding word in the same way as the first word was studied, completing the list.
4. Experimenter pronounce words to class immediately after completion of list and collect papers.

*Test II*

1. Dictate words to class. Collect papers immediately.
2. (a) Experimenter pronounce the word.  
(b) Pupils pronounce and spell the word in concert.
3. Study each succeeding word in the same way as first word was studied, completing the list.  
(a) Study entire list a second time in the same way.  
(b) Study entire list a third time in the same way.
4. Experimenter pronounce words to class immediately after completion of list and collect papers.

*Series A—Test III*

1. Dictate words to class. Collect papers immediately.
2. (a) Experimenter pronounce word.  
(b) Pupils pronounce the first word and spell the first word in concert twice.  
(c) Pronounce and spell the first word in concert.  
Complete the list.
4. Experimenter pronounce words to class immediately after completion of list and collect papers.

Note—A comparison in test 1, 2, and 3 shows that in test 1 each word was pronounced three times in succession; in test 2 each word was pronounced and studied three times after an interval, *i. e.*, the time required to complete the list. In test 3 each word was pronounced and studied three times—twice

in succession and once after an interval, the interval being the time since the last repetition, which interval is a variable quantity, since the interval for the first word is the time required to study nineteen words twice and for the second word the time required to study eighteen words twice and one word once, etc.

*Series B—Test I*

1. Dictate words to the class. Collect papers immediately.
2. (a) Experimenter pronounce word.  
(b) Pupils pronounce word in concert.  
(c) Pupils spell the first word *four* times in concert in succession.
3. Study each succeeding word in the same way as the first word was studied, completing the list.
4. Experimenter pronounce words to class immediately after completion of list and collect papers.

*Test II*

1. Dictate words to class. Collect the papers immediately.
2. (a) Experimenter pronounce first word.  
(b) Pupils pronounce first word in concert.  
(c) Pupils spell first word once in concert.
3. Complete the list, then repeat the same process three times.
4. Experimenter pronounce words to class immediately after completion of list and collect papers.

*Test III*

1. Dictate words to the class. Collect the papers immediately.
2. (a) Experimenter pronounce the first word.  
(b) Pupils pronounce the first word in concert.  
(c) Pupils spell the first word twice in succession in concert.
3. Complete the list, then repeat—2 (c).
4. Experimenter pronounce words to class immediately after completion of list and collect papers.

*Test IV*

1. Dictate the words to the class. Collect the papers immediately.

2. Experimenter pronounce first word.
  - (a) Pupils pronounce the first word in concert.
  - (b) Pupils spell first word twice in succession.
3. Complete the list, then go over the list twice, spelling each word once each time.
4. Experimenter pronounce the words to the class immediately after completion of list and collect papers.

*Test V*

1. Dictate words to the class. Collect papers immediately.
2. (a) Experimenter pronounce first word.
  - (b) Pupils pronounce the first word in concert.
  - (c) Pupils spell the first word three times in concert in succession.
3. Complete the list, then go over the list, spelling each word once.
4. Experimenter pronounce the words to the class immediately after completion of list and collect papers.

The following list of words was used in Series A.

## GRADE III

TEST 1	TEST 2	TEST 3
1. clover	1. locket	1. trolley
2. cloak	2. weave	2. maiden
3. moment	3. psalm	3. control
4. leopard	4. perch	4. vale
5. currant	5. stiffen	5. weather
6. carrot	6. ivory	6. medicine
7. locate	7. elephant	7. bluebells
8. language	8. heroes	8. umbrella
9. wealthy	9. stupid	9. wisdom
10. weedy	10. against	10. pulse
11. thrush	11. northern	11. wharf

12. cipher	12. several	12. tract
13. weave	13. cylinder	13. quotient
14. blade	14. fragrant	14. minuend
15. vote	15. tenderly	15. volcano
16. burdens	16. breathe	16. equator
17. cocoa	17. confuse	17. stomach
18. choir	18. poison	18. instead
19. avoid	19. prairie	19. grassy
20. screw	20. mission	20. scream

## GRADE IV

TEST 1	TEST 2	TEST 3
1. dangerous	1. costume	1. flabby
2. afternoon	2. cashier	2. derrick
3. contrivings	3. expensive	3. Bermuda
4. mulberry	4. ventilator	4. doubly
5. scorpion	5. sparingly	5. Arcadia
6. nuisance	6. succeeded	6. consumption
7. saltpetre	7. mimic	7. declaration
8. sturgeon	8. stifled	8. average
9. exclamation	9. Lansing	9. coaxes
10. Colorado	10. caresses	10. twitted
11. camera	11. ceiling	11. flimsy
12. cement	12. sapphire	12. banquet
13. Detroit	13. interrogation	13. Wednesday
14. intelligence	14. Minnesota	14. ignorant
15. alphabet	15. schooners	15. cartilage
16. catkin	16. abundant	16. piteous
17. decimal	17. caravan	17. anecdote
18. Carolina	18. sinewy	18. columbine
19. diaphragm	19. capitol	19. briers
20. spectacle	20. irregular	20. obeyed

## GRADE V

TEST 1	TEST 2	TEST 3
1. coinage	1. discipline	1. deserter
2. albumen	2. steadily	2. fashionable
3. special	3. Seine	3. pretense
4. emigrants	4. wholly	4. scarecrow
5. desirable	5. monstrous	5. chubby
6. barbarous	6. demerit	6. career
7. longitude	7. Mackenzie	7. essays
8. cupola	8. curbstone	8. bosom
9. Vancouver	9. auburn	9. buttoning
10. gallantly	10. disappoint	10. Havana
11. troupe	11. blithesome	11. degrees
12. masticate	12. actually	12. longitude
13. frightening	13. Oglethorpe	13. damsel
14. desirable	14. Marquette	14. cupola
15. admittance	15. sneaked	15. demon
16. pungent	16. omission	16. collier
17. Ottawa	17. dignified	17. daylight
18. cigarette	18. excellent	18. denial
19. gnarled	19. chastening	19. ruddier
20. reverent	20. czar	20. demerit

## GRADE VI

TEST 1	TEST 2	TEST 3
1. sinecure	1. dimension	1. trophy
2. optical	2. telephone	2. fragile
3. repelled	3. marrow	3. vehemence
4. pretzel	4. conqueror	4. phonograph
5. Illinois	5. masticate	5. resurrect
6. phosphate	6. isinglass	6. singeing
7. numskull	7. proteids	7. chrysalis
8. papoose	8. physician	8. conqueror
9. Seattle	9. astringent	9. razor

10. wreckage	10. oracle	10. firkin
11. pontoon	11. ruffian	11. bivalve
12. sycamore	12. DuQuesne	12. radius
13. millinery	13. pugilist	13. pioneers
14. intertwine	14. burglar	14. chattel
15. senior	15. equivocate	15. urgently
16. gymnasium	16. vicissitude	16. temperature
17. parenthesis	17. phonograph	17. brogan
18. pantaloons	18. crockery	18. infringe
19. pinion	19. perforate	19. colonial
20. Sumatra	20. moral	20. equivocate

## GRADE VII

TEST 1	TEST 2	TEST 3
1. superficial	1. exhortation	1. disinherit
2. persistent	2. pugnacious	2. equitable
3. requisite	3. systemic	3. joviality
4. lusciousness	4. carat	4. aviary
5. corpuscles	5. subterranean	5. auricles
6. Mozambique	6. rigorous	6. condescend
7. spiritualism	7. obscurity	7. officious
8. monotony	8. luxuriant	8. spasmodic
9. Oceanica	9. Monotheism	9. annually
10. Yokohama	10. tragedian	10. humidity
11. monstrosity	11. cotton-gin	11. sociability
12. plague	12. tortuous	12. luxurious
13. proficient	13. submaxillary	13. sewer
14. ironical	14. peculiarly	14. hydrant
15. subjugate	15. originally	15. ulcerate
16. courteous	16. provender	16. petrify
17. transparent	17. propulsion	17. perusal
18. superbly	18. instigation	18. pneumonia
19. tincture	19. perjure	19. translation
20. reversible	20. solicit	20. infinitive

## GRADE VIII

TEST I	TEST 2	TEST 3
1. thermometer	1. sepulcher	1. treasonable
2. auditorium	2. cranial	2. traditional
3. Buchanan	3. cotillion	3. anodyne
4. antithesis	4. complete	4. ulceration
5. municipal	5. pulmonary	5. versatile
6. incandescent	6. negotiable	6. symmetry
7. collegiate	7. commissary	7. congruity
8. monastery	8. translucent	8. putrefaction
9. atomizer	9. auditorium	9. thermometer
10. cuspidor	10. bituminous	10. massacre
11. symmetry	11. Lowell	11. Barbadoes
12. courier	12. enervate	12. visionary
13. property	13. misdemeanor	13. Nevada
14. synecdoche	14. vaccinate	14. impassable
15. tympanum	15. neuralgia	15. tyrannize
16. statutory	16. soliloquy	16. contusion
17. puritanical	17. asylum	17. pulmonary
18. reservation	18. zouave	18. conception
19. crystalline	19. subsidize	19. volubility
20. lettuce	20. audacious	20. solicitor



The following list of words was used in Series B.

### GRADE III

1	2	3	4	5
1. walnut	1. breathe	1. acute	1. silence	1. Mongolian
2. cruelly	2. tighten	2. hateful	2. hinge	2. reptile
3. replied	3. southern	3. ashamed	3. sweat	3. rooster
4. mahogany	4. service	4. spicy	4. chalky	4. Mississippi
5. whoa	5. sneeze	5. odor	5. southern	5. treasure
6. tumbler	6. pistil	6. diamonds	6. Japanese	6. Malay
7. precious	7. bridle	7. oblique	7. enamel	7. saucy
8. Yucatan	8. semi-circle	8. foreign	8. exercise	8. complete
9. cinder	9. tempt	9. continent	9. bruises	9. temperature
10. whiskey	10. tobacco	10. vegetable	10. Hiawatha	10. blacksmith
11. anxious	11. mahogany	11. isthmus	11. height	11. eighty
12. alligator	12. asparagus	12. moving	12. salad	12. captain
13. stomach	13. strength	13. walrus	13. smother	13. shepherd
14. nineteen	14. Michigan	14. tuber	14. capital	14. pollen
15. waking	15. envelope	15. several	15. peninsula	15. corolla
16. parallel	16. hasten	16. Ontario	16. castle	16. calyx
17. kingdom	17. alcohol	17. chintz	17. soiling	17. Eskimos
18. queer	18. anvil	18. surround	18. whate'er	18. meddle
19. bicycle	19. prison	19. parson	19. person	19. mineral
20. petroleum	20. atmosphere	20. Chinese	20. Schuylkill	20. erase

### GRADE IV

1	2	3	4	5
1. polar	1. repose	1. obstacle	1. kerosene	1. exactly
2. pampas	2. clung	2. bargains	2. aisle	2. groceries
3. cemetery	3. project	3. geysers	5. arteries	3. sycamore
4. certain	4. formation	4. liquor	4. seizing	4. absorb
5. destruction	5. crayon	5. warriors	5. actual	5. abundant
6. delicious	6. farmyard	6. cologne	6. caution	6. annoy
7. repose	7. Whittier	7. telegraph	7. bouquet	7. pendulum
8. endeavor	8. ledger	8. sheltered	8. thorough	8. amethyst
9. China	9. bulbous	9. Mildred	9. disguise	9. conductor
10. plentiful	10. happily	10. nineteen	10. religious	10. singular
11. cleanliness	11. chasms	11. radiant	11. privilege	11. ourselves
12. brakeman	12. thistle	12. Yukon	12. scattering	12. Baltimore
13. chamois	13. plague	13. evident	13. niece	13. llama
14. Creator	14. medium	14. immense	14. drought	14. Chesapeake
15. contraction	15. City Hall	15. knuckle	15. Elizabeth	15. perspiration
16. ridged	15. finally	16. alphabet	16. inflamed	16. squeeze
17. decorate	17. machine	17. absorb	17. knuckle	17. scissors
18. wrought	18. opinion	18. sunnier	18. Alabama	18. grammar
19. curious	19. obedient	19. quivering	19. sunnier	19. torture
20. vowel	20. monument	20. evident	20. censure	20. notable

# GRADE V

1	2	3	4	5
1. ruddier	1. crayon	1. pursuit	1. cornstalk	1. cupola
2. clotted	2. Raleigh	2. imagine	2. engineer	2. troupe
3. pretense	3. multiple	3. sociable	3. woodbine	3. scene
4. fashionable	4. axle-tree	4. capillaries	4. physician	4. Magellan
5. dissolves	5. apparatus	5. epaulets	5. Valparaiso	5. receiving
6. Ottawa	6. hoarse	6. Lehigh	6. photograph	6. wedded
7. apparel	7. Honolulu	7. oxygen	7. limpid	7. reverent
8. thousandths	8. parenthesis	8. cavern	8. gorilla	8. aromatic
9. lemon	9. decimal	9. Cayenne	9. Manila	9. bruise
10. chocolate	10. antennae	10. magistrate	10. colonel	10. brew
11. punctual	11. bare-headed	11. whirling	11. avoirdupois	11. whirling
12. diphtheria	12. angrily	12. poverty	12. chrysalis	12. plunging
13. Gettysburg	13. whoop	13. glorious	13. valiant	13. conjunction
14. precipice	14. shamrock	14. sulphur	14. furnace	14. Missouri
15. raisins	15. castile-soap	15. nautical	15. ceases	15. adorned
16. abyss	16. better	16. halibut	16. masticate	16. demolish
17. volcanic	17. microscope	17. negligence	17. gallantry	17. chamois
18. luscious	18. fowl	18. emerald	18. gnarled	18. government
19. encouraged	19. piteous	19. fertile	19. desirable	19. smugglers
20. residence	20. methinks	20. wanders	20. alcoholic	20. ejected

# GRADE VI

1	2	3	4	5
1. mutiny	1. interment	1. vulgarity	1. vessels	1. windlass
2. proteids	2. prepositional	2. duodenum	2. solvency	2. pompous
3. humorist	3. Constantinople	3. worrying	3. fraudulently	3. bolster
4. microscope	4. prosecute	4. prosy	4. pickerel	4. epiglottis
5. equivocate	5. jostling	5. Burgoyne	5. plaintiff	5. cranberry
6. serenely	6. Dneiper	6. lyceum	6. traverse	6. pique
7. chastise	7. druggist	7. stampede	7. Euphrates	7. cereal
8. vehemence	8. reunite	8. ween	8. brethren	8. granary
9. pretzel	9. extortion	9. elastic	9. wizard	9. detestable
10. insolvent	10. abbreviation	10. Tripoli	10. placid	10. ventilator
11. oriole	11. arson	11. stalwart	11. artillery	11. estuary
12. ruffian	12. specie	12. acknowledge	12. Arabia	12. torpedo
13. Monmouth	13. pinnacle	13. analysis	13. aptness	13. Chippewa
14. ascending	14. notary	14. starvation	14. arbutus	14. luxuriant
15. Brussels	15. treacherous	15. synovia	15. braid	15. Antwerp
16. coupling	16. purloin	16. approval	16. moisture	16. pleasurable
17. battery	17. lymphatics	17. console	17. conceited	17. adverbial
18. Pyrenees	18. Brahmanism	18. digestible	18. ewes	18. syringe
19. twinging	19. trombone	19. spherical	19. estuary	19. slough
20. rotate	20. arsenal	20. excavate	20. menial	20. weasel

## GRADE VII

1	2	3	4	5
1. adroitly	1. malefactor	1. publicity	1. nostrils	1. chemistry
2. calabash	2. magistrate	2. protestant	2. Winchester	2. jocularity
3. gentility	3. politician	3. ancestral	3. horticulture	3. cavity
4. felony	4. lithograph	4. counterfeit	4. cremation	4. coagulation
5. abscond	5. infamous	5. reversible	5. atrocious	5. paradise
6. linguist	6. auricle	6. wristband	6. window	6. oscillate
7. mimicry	7. Bowdoin	7. corpuscles	7. suture	7. Guardafui
8. embarrass	8. annually	8. matriculate	8. meagerly	8. buoyant
9. Tanganyika	9. reprimand	9. baize	9. Australia	9. vigilant
10. neuralgia	10. lynx	10. upholster	10. brokerage	10. extol
11. whimsical	11. cranium	11. Hawthorne	11. octagonal	11. depreciate
12. Tippecanoe	12. provident	12. authentic	12. visitant	12. wary
13. covetous	13. submaxillary	13. aviary	13. doctrine	13. Chickamauga
14. theatrical	14. submarine	14. disinherit	14. payee	14. variable
15. ulcerate	15. winsome	15. Thibet	15. penury	15. distinguished
16. zither	16. wiry	16. orphanage	16. flexors	16. lieutenant
17. vixen	17. propellor	17. mustiness	17. grumpiness	17. hosiery
18. coroner	18. cosmetic	18. midshipman	18. compiling	18. ottoman
19. etiquette	19. involuntary	19. premeditate	19. loitering	19. bullion
20. ordinance	20. Edison	20. avalanche	20. oiliness	20. massacre

## GRADE VIII

1	2	3	4	5
1. Divine	1. justice	1. criminate	1. versatile	1. sophomore
2. waning	2. noiseless	2. grater	2. subsidy	2. cochineal
3. perjury	3. aquarium	3. crinoline	3. compliment	3. coherency
4. reservoir	4. catapult	4. cotillion	4. synecdoche	4. obliteration
5. benevolence	5. legitimate	5. corroborate	5. pious	5. ingredient
6. perquisite	6. expiate	6. Transvaal	6. sustenance	6. minority
7. loquacious	7. verbiage	7. cupidor	7. contusion	7. posterity
8. Madeira	8. Farragut	8. duteous	8. Garfield	8. chandelier
9. region	9. refutation	9. bigoted	9. usurious	9. Goldsmith
10. serpent	10. equestrian	10. tacitly	10. austerity	10. vitreous
11. Altoona	11. pyrotechnic	11. inflammable	11. avaricious	11. bravado
12. virulent	12. antithesis	12. Carlyle	12. convivial	12. Brooklyn
13. itinerary	13. Ecuador	13. stultify	13. innovation	13. chloroform
14. evangelist	14. disseminate	14. sponge	14. metonymy	14. salubrious
15. frivolity	15. incarcerate	15. prevaricate	15. ostentation	15. clemency
16. mutually	16. sumptuary	16. husbandry	16. Polynesia	16. neutrality
17. transiently	17. apothecary	17. secretary	17. frigidity	17. celerity
18. tympanum	18. trapezoid	18. polysyllable	18. collision	18. resuscitate
19. auditorium	19. convoy	19. stigmatize	19. volatile	19. brunette
20. convalesce	20. substantiate	20. actually	20. cheroot	20. oviform

TABLE X.

*Showing the Number and Percentage Learned Immediately After Study*

SERIES A—TEST 1—Three oral repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number of Words Missed After Study	Number of Words Learned	Percentage Learned
Grade III.....	52	733	434	299	41
Grade IV.....	43	475	248	225	47
Grade V.....	43	664	298	366	55
Grade VI.....	31	349	87	262	75
Grade VII.....	37	502	171	331	66
Grade VIII.....	31	395	159	236	59

TEST 2—Three oral repetitions—Two repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Grade III.....	52	758	389	369	49
Grade IV.....	43	651	290	361	55
Grade V.....	43	620	207	413	66
Grade VI.....	31	364	101	263	72
Grade VII.....	37	525	164	361	69
Grade VIII.....	31	297	54	243	82

TEST 3—Three oral repetitions—Two continuous and one after an interval the length of which was the time required to complete the study of list twice.

Grade III.....	52	644	347	297	46
Grade IV.....	43	683	351	332	49
Grade V.....	43	527	157	370	70
Grade VI.....	31	387	92	295	76
Grade VII.....	37	435	126	309	71
Grade VIII.....	31	259	70	189	73

The weather was fair or clear for tests 1, 2 and 3.

The time was approximately the same in all tests, varying somewhat according to grade. Grades 3 and 4 required about 1 minute longer than the other grades. The average time for Grades 5 to 8 was 5 minutes.

TABLE XI

*Showing the Number and Percentage Learned at End of Week*

## SERIES A—TEST 1—Three oral repetitions.

	Number of Pupils	Number of Words Missed Before Study	Number of Words Missed End of Week	Number of Words Learned at End of Week	Percentage Learned at End of Week
Grade III.....	52	733	535	198	27
Grade IV.....	43	475	252	223	46
Grade V.....	43	664	371	293	44
Grade VI.....	31	349	159	190	54
Grade VII.....	37	502	276	226	45
Grade VIII.....	31	395	196	199	50

TEST 2—Three oral repetitions—Two repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Grade III.....	52	758	528	230	30
Grade IV.....	43	651	393	258	40
Grade V.....	43	620	375	245	39
Grade VI.....	31	364	166	198	54
Grade VII.....	37	525	280	245	47
Grade VIII.....	31	297	115	182	61

TEST 3—Three oral repetitions—Two continuous and one after an interval the length of which was the time required to complete the study of the list twice.

Grade III.....	52	644	462	182	28
Grade IV.....	43	683	417	266	39
Grade V.....	43	527	308	219	40
Grade VI.....	31	387	217	170	44
Grade VII.....	37	435	252	183	42
Grade VIII.....	31	259	113	146	56

Weather clear or fair when review was given at end of week.

TABLE XII

*Showing the Average Number and Percentage Learned After Study*

SERIES A—TEST 1—Three oral repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number of Words Missed After Study	Average Number of Words Learned	Percentage Learned
Grade III.....	52	14.1	8.3	5.8	41
Grade IV.....	43	11.5	5.8	5.3	47
Grade V.....	43	15.4	6.9	8.5	55
Grade VI.....	31	11.5	3.	8.5	75
Grade VII.....	37	13.6	4.6	8.9	66
Grade VIII.....	31	12.8	5.6	7.6	59

TEST 2—Three oral repetitions—Two repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Grade III.....	52	14.6	7.5	7.1	49
Grade IV.....	43	15.1	6.7	8.4	55
Grade V.....	43	14.4	5.	9.6	66
Grade VI.....	31	11.9	3.3	8.5	72
Grade VII.....	37	14.2	4.4	9.7	69
Grade VIII.....	31	9.6	1.7	7.9	82

TEST 3—Three oral repetitions—Two continuous and one after an interval the length of which was the time required to complete the study of the list twice.

Grade III.....	52	12.4	6.7	5.5	46
Grade IV.....	43	15.9	8.2	7.7	49
Grade V.....	43	12.3	3.7	8.6	70
Grade VI.....	31	12.7	3.1	9.5	76
Grade VII.....	37	11.8	3.4	8.3	71
Grade VIII.....	31	8.4	2.3	6.1	73

Weather conditions same as noted after Table X.

TABLE XIII

*Showing the Average Number and Percentage Learned at End of Week*

SERIES A—TEST 1—Three oral repetitions—continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number of Words Missed at End of Week	Average Number of Words Learned at End of Week	Percentage Learned at End of Week
Grade III.....	52	14.1	10.3	3.9	27
Grade IV.....	43	11.5	5.9	5.1	46
Grade V.....	43	15.4	8.7	6.8	44
Grade VI.....	31	11.5	5.4	6.1	54
Grade VII.....	37	13.6	7.5	6.1	45
Grade VIII.....	31	12.8	6.3	6.4	50

TEST 2—Three oral repetitions—Two repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Grade III.....	52	14.6	10.9	4.3	30
Grade IV.....	43	15.1	9.1	6.	40
Grade V.....	43	14.4	8.8	5.7	39
Grade VI.....	31	11.9	5.5	6.4	54
Grade VII.....	37	14.2	7.6	6.6	47
Grade VIII.....	31	9.6	3.8	5.9	61

TEST 3—Three oral repetitions—Two continuous and one after an interval, the length of which was the time required to complete the study of the list twice.

Grade III.....	52	12.4	9.1	3.5	28
Grade IV.....	43	15.9	9.6	6.2	39
Grade V.....	43	12.3	7.3	5.	40
Grade VI.....	31	12.7	6.9	5.5	44
Grade VII.....	37	11.8	6.8	4.9	42
Grade VIII.....	31	8.4	3.7	4.7	56

Weather conditions same as noted previously.

TABLE XIV

*Comparison of Per Cent Learned and Retained*

SERIES A—TEST 1—Three oral repetitions—continuous.

	Number of Pupils	Percentage of Words Learned	Percentage of Words Retained at End of Week
Grade III.....	52	41	27
Grade IV.....	43	47	46
Grade V.....	43	55	44
Grade VI.....	31	75	54
Grade VII.....	37	66	45
Grade VIII.....	31	59	50
<i>Average.....</i>	..	57.2	43.8

TEST 2—Three oral repetitions—Two repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Grade III.....	52	49	30
Grade IV.....	43	55	40
Grade V.....	43	66	39
Grade VI.....	31	72	54
Grade VII.....	37	69	47
Grade VIII.....	31	82	61
<i>Average.....</i>	..	65.5	45.2

TEST 3—Three oral repetitions—Two continuous and one after an interval the length of which was the time required to complete the study of the list twice.

Grade III.....	52	46	28
Grade IV.....	43	49	39
Grade V.....	43	70	40
Grade VI.....	31	76	44
Grade VII.....	37	71	42
Grade VIII.....	31	73	56
<i>Average.....</i>	..	64.2	41.5



TABLE XV

*Showing Number and Percentage of Words Learned Immediately After Study*

SERIES B—TEST 1—Four oral repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number of Words Missed After Study	Number of Words Learned	Percentage Learned
Grade III.....	25	358	199	159	44.4
Grade IV.....	27	368	182	186	51.1
Grade V.....	33	376	185	191	50.9
Grade VI.....	29	271	63	218	76.1
Grade VII.....	26	287	61	226	78.2
Grade VIII.....	26	236	67	169	71.4

TEST 2—Four oral repetitions—Three repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Grade III.....	25	346	207	139	40.
Grade IV.....	27	274	62	212	77.2
Grade V.....	33	372	119	153	66.2
Grade VI.....	29	264	66	198	74.7
Grade VII.....	26	289	38	251	86.5
Grade VIII.....	26	200	60	140	70.4

TEST 3—Four oral repetitions—Two continuous then two continuous a second time after an interval the length of which was the time required to complete the list twice.

Grade III.....	25	388	124	264	67.7
Grade IV.....	27	308	110	198	64.
Grade V.....	33	306	80	226	73.8
Grade VI.....	29	229	51	178	75.
Grade VII.....	26	265	55	210	79.4
Grade VIII.....	26	243	50	193	79.6

TEST 4—Four oral repetitions—Two continuous then one repetition after an interval the length of which was the time required to complete the list twice and then one repetition after an interval the length of which was the time required to complete the list once.

Grade III.....	25	319	173	146	46.1
Grade IV.....	27	331	154	177	53.3
Grade V.....	33	315	97	218	68.5
Grade VI.....	29	143	14	129	89.8
Grade VII.....	26	212	39	173	81.7
Grade VIII.....	26	251	94	157	62.9

TEST 5—Four oral repetitions—Three continuous, then one repetition after an interval the length of which was the time to complete the list with the three continuous repetitions.

Grade III.....	25	360	200	160	44.4
Grade IV.....	27	367	121	146	66.9
Grade V.....	33	266	80	186	70.7
Grade VI.....	29	204	34	170	82.9
Grade VII.....	26	236	44	192	81.3
Grade VIII....	26	198	56	142	71.1

The weather was fair or clear for all tests.  
Time approximately the same as series A.

TABLE 'XVI

*Showing the Number and Percentage of Words Learned at End of Week*

SERIES B—TEST 1—Four oral repetitions—continuous.

	Number of Pupils	Number of Words Missed Before Study	Number of Words Missed at End of Week	Number of Words Learned at End of Week	Percentage Learned at End of Week
Grade III.....	25	358	250	108	30.1
Grade IV.....	27	368	270	98	21.6
Grade V.....	33	376	223	153	40.3
Grade VI.....	29	271	133	138	50.5
Grade VII.....	26	287	152	135	56.4
Grade VIII....	26	236	103	133	56.1

TEST 2—Four oral repetitions—Three repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Grade III.....	25	346	267	79	22.5
Grade IV.....	27	274	149	125	45.5
Grade V.....	33	372	176	200	53.1
Grade VI.....	29	264	101	163	60.4
Grade VII.....	26	289	112	177	61.3
Grade VIII....	26	200	86	114	57.1

TEST 3—Four oral repetitions—Two continuous, then two continuous a second time after an interval the length of which was the time required to complete the list twice.

Grade III.....	25	388	298	90	23.2
Grade IV.....	27	308	176	132	43.
Grade V.....	33	306	173	133	42.2
Grade VI.....	29	229	121	108	41.7
Grade VII.....	26	265	118	147	55.9
Grade VIII.....	26	243	90	153	62.4

TEST 4—Four oral repetitions—Two continuous, then one repetition after an interval the length of which was the time required to complete the list twice and then one repetition after an interval the length of which was the time required to complete the list once.

Grade III.....	25	319	216	103	32.8
Grade IV.....	27	331	248	83	24.6
Grade V.....	33	315	183	132	40.2
Grade VI.....	29	143	37	106	73.5
Grade VII.....	26	212	85	127	59.7
Grade VIII.....	26	251	125	126	50.5

TEST 5—Four oral repetitions—Three continuous, then one repetition after an interval the length of which was the time to complete the list with the three continuous repetitions.

Grade III.....	25	360	269	160	25.
Grade IV.....	27	367	218	149	40.4
Grade V.....	33	266	151	115	43.2
Grade VI.....	29	204	85	119	58.6
Grade VII.....	26	236	126	110	47.2
Grade VIII.....	26	198	97	101	50.1

Time and weather conditions same as Test 1.

TABLE XVII

*Showing the Average Number and Percentage of Words Learned After Study*

SERIES B—TEST 1—Four oral repetitions—continuous.

	Number of Pupils	Average Number Words Missed Before Study	Average Number Words Missed After Study	Average Number Words Learned	Percentage Learned
Grade III.....	25	14.3	8.	6.3	44.4
Grade IV.....	27	13.9	6.7	7.2	51.1
Grade V.....	33	11.4	5.6	5.8	50.9
Grade VI.....	29	9.3	2.2	7.1	76.1
Grade VII.....	26	11.	2.4	8.6	87.2
Grade VIII.....	26	9.1	2.6	6.5	71.4

**TEST 2**—Four oral repetitions—Three repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Grade III.....	25	13.8	8.3	5.5	40.
Grade IV.....	27	10.1	2.3	7.8	77.2
Grade V.....	33	11.3	3.6	7.7	66.2
Grade VI.....	29	9.1	2.3	6.8	74.7
Grade VII.....	26	11.1	1.5	9.6	86.5
Grade VIII.....	26	7.7	2.3	5.4	70.4

**TEST 3**—Four oral repetitions—Two continuous, then two continuous a second time after an interval the length of which was the time required to complete the list twice.

Grade III.....	25	15.5	5.	10.5	67.7
Grade IV.....	27	11.4	4.1	7.3	64.
Grade V.....	33	9.	2.4	6.6	73.8
Grade VI.....	29	7.2	1.8	5.4	75.
Grade VII.....	26	10.2	2.1	8.1	79.4
Grade VIII.....	26	9.3	1.9	7.4	79.6

**TEST 4**—Four oral repetitions—Two continuous, then one repetition after an interval the length of which was the time required to complete the list twice, and then one repetition after an interval the length of which was the time required to complete the list once.

Grade III.....	25	9.2	2.9	6.3	68.5
Grade IV.....	27	4.9	.5	4.4	89.8
Grade V.....	33	8.2	1.5	6.7	81.7
Grade VI.....	29	9.7	3.	6.1	62.9
Grade VII.....	26	14.4	8.	6.4	44.4
Grade VIII.....	26	13.6	4.5	9.1	66.9

**TEST V**—Four oral repetitions—Three continuous, then one repetition after an interval the length of which was the time to complete the list with three continuous repetitions.

Grade III.....	25	14.4	8.	6.4	44.4
Grade IV.....	27	13.6	4.5	9.1	66.9
Grade V.....	33	8.1	2.4	5.7	70.7
Grade VI.....	29	7.	1.2	5.8	82.9
Grade VII.....	26	9.1	1.7	7.4	81.3
Grade VIII.....	26	7.6	2.2	5.4	71.1

Time and weather conditions same as Test 1.

TABLE XVIII

*Showing the Average Number and Percentage of Words Learned at End of Week*

**SERIES B—TEST I—Four oral repetitions—continuous.**

	Number of Pupils	Average Number of Words Missed Before Study	Average Number of Words Missed at End of Week	Average Number of Words Learned at End of Week	Percentage Learned at End of Week
Grade III.....	25	14.3	10.	4.3	30.1
Grade IV.....	27	13.9	10.	3.9	21.6
Grade V.....	33	11.4	6.8	4.6	40.3
Grade VI.....	29	9.3	4.6	4.7	50.5
Grade VII.....	26	11.	5.8	5.2	56.4
Grade VIII.....	26	9.1	4.	5.1	56.1

**TEST II—Four oral repetitions—Three repetitions, each of which was after an interval the length of which was the time required to study the other words of the list.**

Grade III.....	25	13.8	10.7	3.1	22.5
Grade IV.....	27	10.1	5.5	4.6	45.5
Grade V.....	33	11.3	5.3	6.	53.1
Grade VI.....	29	9.1	3.5	5.6	60.4
Grade VII.....	26	11.1	4.3	6.8	61.3
Grade VIII.....	26	7.7	3.3	4.4	57.1

**TEST 3—Four oral repetitions—Two continuous, then two continuous a second time after an interval the length of which was the time required to complete the list twice.**

Grade III.....	25	15.5	11.9	3.6	23.2
Grade IV.....	27	11.4	6.5	4.9	43.
Grade V.....	33	9.	5.2	3.8	42.2
Grade VI.....	29	7.2	4.2	3.	41.7
Grade VII.....	26	10.2	4.5	5.7	55.9
Grade VIII.....	26	9.3	3.5	5.8	62.4

**TEST 4—Four oral repetitions—Two continuous, then one repetition after an interval the length of which was the time required to complete the list twice and then one repetition after an interval the length of which was the time required to complete the list once.**

Grade III.....	25	12.8	8.6	4.2	32.8
Grade IV.....	27	12.2	9.2	3.	24.6
Grade V.....	33	9.2	5.5	3.7	40.2
Grade VI.....	29	4.9	1.3	3.6	73.5
Grade VII.....	26	8.2	3.3	4.9	59.7
Grade VIII.....	26	9.7	4.8	4.9	50.5

TEST 5—Four oral repetitions—Three continuous, then one repetition after an interval the length of which was the time required to complete the list with the three continuous repetitions.

Grade III.....	25	14.4	10.8	3.6	25.
Grade IV.....	27	13.6	8.1	5.5	40.4
Grade V.....	33	8.1	4.6	3.5	43.2
Grade VI.....	29	7.	2.9	4.1	58.6
Grade VII.....	26	9.1	4.8	4.3	47.2
Grade VIII.....	26	7.6	3.7	3.9	50.1

Weather and time conditions same as previously noted.

TABLE XIX

*Comparison of Percent Learned and Retained*

SERIES B—TEST 1—Four oral repetitions—Continuous.

	Number of Pupils	Percentage of Words Learned	Percentage of Words Retained at End of Week
Grade III.....	25	44.4	30.1
Grade IV.....	27	51.1	21.6
Grade V.....	33	50.9	40.3
Grade VI.....	29	76.1	50.5
Grade VII.....	26	78.2	56.4
Grade VIII.....	26	71.4	56.1
<i>Average.....</i>	..	62.	42.5

TEST 2—Four oral repetitions—Three repetitions, each of which was after an interval the length of which was the time required to study the other words of the list.

Grade III.....	25	40.	22.5
Grade IV.....	27	77.2	45.5
Grade V.....	33	66.2	53.1
Grade VI.....	29	74.7	60.4
Grade VII.....	26	86.5	61.3
Grade VIII.....	26	70.4	57.1
<i>Average.....</i>	..	69.2	50.

TEST 3—Four oral repetitions—Two continuous, then two continuous a second time after an interval the length of which was the time required to complete the list twice.

Grade III.....	25	67.7	23.2
Grade IV.....	27	64.	43.
Grade V.....	33	73.8	42.2
Grade VI.....	29	75.	41.7
Grade VII.....	26	79.4	55.9
Grade VIII.....	26	79.6	62.4
Average.....	..	73.3	44.7

TEST 4—Four oral repetitions—Two continuous, then one repetition after an interval the length of which was the time required to complete the list twice and then one repetition after an interval the length of which was the time required to complete the list once.

Grade III.....	25	46.1	32.8
Grade IV.....	27	53.3	24.6
Grade V.....	33	68.5	40.2
Grade VI.....	29	89.8	73.5
Grade VII.....	26	81.7	59.7
Grade VIII.....	26	62.9	50.5
Average.....	..	67.5	46.9

TEST 4—Four oral repetitions—Three continuous, then one repetition after an interval the length of which was the time required to complete the list with the three continuous repetitions.

Grade III.....	25	44.4	25.
Grade IV.....	27	66.9	40.4
Grade V.....	33	70.7	43.2
Grade VI.....	29	82.9	58.6
Grade VII.....	26	81.3	47.2
Grade VIII.....	26	71.1	50.1
Average.....	..	69.6	44.1

### *Analysis of Series A—Test 1, 2 and 3*

Examination of results shows that Grades 3, 4, and 8 learned the largest percentage of words in Test 2, and that Grades 5, 6, and 7 learned the largest percentage in Test 3, both of which had repetition after an interval. The average percentage of words learned in the 6th Grade in Test 1 is 57.2; in Test 2, 65.5; in Test 3, 64.2; making 8.3 percent in favor of Test 2, the characteristic of which was repetition after an interval. In

comparison of Test 1 and 3 there is a difference of 7 percent in favor of Test 3, the characteristic of which was repetition after an interval, the interval being different from that of Test 2.

In general, as shown by the average for the six grades the results were the same for the end of the week, there being a difference of 1.4 percent in favor of Test 2. In particular grades, however, the advantage is in favor of Test 1 in Grades 4 and 5.

*Analysis of Series B—Tests 1, 2, 3, 4, and 5*

Examination of the individual record kept for each pupil shows that one pupil in Grade 4, missed not any words after the study in Test 2; in Grade 4, three pupils missed not any in Test 2, five pupils not any in Test 3, one not any in Test 4, and three not any in Test 5; in Grade 6 one pupil missed not any in Test 2, six not any in Test 3, seven not any in Test 4, seven not any in Test 5; in Grade 7, five pupils missed not any in Test 2, two Test 3, one in Test 4, three in Test 5; in Grade 8, two missed not any in Test 3, three missed not any in Test 5. This signifies that each of these different pupils might have learned more words in these Tests 2, 3, 4, and 5, than they did. This would have increased the percentage of words learned in Tests 2, 3, 4, and 5, in all of which the characteristic was repetition after an interval, the interval varying as noted in the plan of the tests. It is to be especially noted that no individual cases learned all of the words in Test 1, the characteristic of which was continuous repetition.

Further examination of results shows that Grades 4 and 7 learned the largest percentage of words in Test 2. Grades 3, 5, and 8 learned the largest percentage of words in Test 3, and Grade 6 learned the largest percentage of words in Test 4. The characteristic of Tests 2, 3, and 4 was repetition after an interval.

The average percentage of words learned in the six grades in Test 1 was 62, in Test 2, 69.2, making a difference of 7.2 percent in favor of Test 2, the characteristic of which was repetition after an interval. In comparison of Test 1 with Test 3 the average of which was 73.3, there is a difference of 11.3 percent



in favor of Test 3, the characteristic of which was repetition after an interval. In comparison of Test 1 with Test 4, the average of which is 67.5, there is a difference of 5.5 percent in favor of Test 4, the characteristic of which is repetition after an interval. In comparison of Test 1 with Test 5, the average of which is 69.6, there is a difference of 7.6 percent in favor of Test 5, the characteristic of which is repetition after an interval.

A comparison of the results gained in comparing Test 2, 3, 4, and 5 with Test 1 shows that in this experiment Test 3 was the best, reaching 11.3 percent greater efficiency than Test 1.

In comparison of the results at the end of the week Grades 4, 5, and 7 retain the highest percentage of words in Test 2; Grade 8 retained the highest percentage in Test 3; Grades 3 and 6 retained the highest percentage in Test 4. The general average is the highest in Test 2. In comparison with Test 1 there is an advantage of 7.5 percent in favor of Test 2.

This experiment shows that, in spelling, both, in immediate results and in results at the end of the week, repetition after an interval is more effective in memorizing than continuous repetition.

## PART III

### EXPERIMENT III

The purpose of experiment three was the same as in experiment one and two.

Plan—Experience in experiments one and two suggested the following improvements for experiment three.

1. To have the study of the words as near as possible under the same conditions as the regular spelling lesson.\* For this reason the words selected for the test were printed on pieces of cardboard in the same kind of type as used in the spelling book, observing syllabification and accent marks as in regular spelling book.

2. A device was planned to cover all the words except the particular word being studied. This device was a piece of cardboard with a rectangular opening cut in it one and one-quarter inches long and one-quarter inch wide. It was easy for the pupil to slide this card-board along, exposing the next word each time for study. Practice was given in the use of this device to all pupils previous to using it the first time. This was done so that the strangeness of the device would not interfere in any way with results.

3. Test 1 was given third and Test 3 was given first in the series. This change in order was made because it was observed that a certain amount of efficiency was acquired toward the end of the series. The order probably had nothing to do with the results, because most of the pupils in experiment III had had experience with experiment one and two.

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\* Experience in previous experiments made it evident that a change from studying the printed to the written word on the board was a disturbing factor. This was discovered by having a number of tests in studying words—those studied from board compared with those studied from book. Those studied from books showed the highest percentage learned each time. This was probably due to change of form of word and the word was too far away giving too much chance for distraction of attention. It was decidedly easier to hold attention to printed word.

4. The children were especially asked not to think about the words after the experimenter left the room.\* In a large degree this was done as the children immediately returned to their regular work.

5. All the experiments were conducted, entirely, by myself, thus eliminating the disturbing factor of having a number of different experimenters in the same series of tests. Preliminary experiments were made in each case so that the pupils were familiar with the method and manner of the experimenter before the real experiment was given, in addition to this I was known personally by all the pupils.

The following were the details of the plan used in this experiment:

1. The test was made in Grades 5, 6, 7, and 8. Grades four and five were not tested because by trial it was found that they could not use device well.

2. Twenty words in each test were selected, so that there was a large number of words to be learned by the class. Both long and short words were selected. Any special difficulty in spelling was avoided. In one list, Grade V, Test III, the word fowl was defined each time when pronounced. This was necessary, in order that the students would spell the right word. In Grade VIII, Test III, the word polysyllable, by accident had the first "y" omitted in the printing of the slips. The error was not observed until the test was being made. The pupils were marked on a basis of 19 words in Test A-3.

3. All tests were made at the same time of day, between 8:45 and 10:00 A. M. This was done so as to have the same mental condition of the children as far as possible in each test. Weather conditions were noted as clear, fair or cloudy. The temperature, 68 degrees, was uniform in the rooms.

4. Any pupil being especially abnormal in spelling was not counted in the test. The pupils took the words with the class,

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\*In previous experiments no request of this kind was made, but individual cases came to my attention in which pupils did discuss the words. In this experiment no such cases came to my attention.

but papers were rejected in results. The same was done with respect to pupils who were not in good physical condition at the time of test.

5. The length of time spent in the study of the words was the same in each test. By preliminary tests I had learned to pass from one word to the other promptly and to conduct the detail of the experiment in such a way that there was practically no difference in time in Tests I, II, and III. The variation was always less than one-fourth ( $\frac{1}{4}$ ) of a minute. This practically eliminated the time conditions in the tests.

6. Only the papers of the pupils present for all the tests were considered in the results.

7. The same list of words was pronounced at the end of week, at the same time of day. This was called the Review.

8. All papers were corrected under my immediate direction. The results were recorded as follows:

A record was made of weather conditions, or social function that might have interfered with the accuracy of results. A record was made of the number of words missed in the preliminary test, the number missed after study, and the number missed at the end of the week. The number missed in the preliminary test less the number missed after study was the number of words learned. The number of words learned divided by the number possible to be learned, *i. e.*, the number missed in preliminary test, gives the percentage learned.

*Observation*—The device for covering the words evidently was a disturbing factor to those pupils who lacked the ability to concentrate. These pupils showed very little learning power when using the device. After some additional tests I was convinced, that as far as these pupils were concerned the device was a disturbing factor, but of course it was a disturbing factor in each of the tests, and therefore would not affect the validity of the results in any way.

#### *Plan of the Tests*

The tests were made at the time of day indicated above, between 8:45 and 10:00 A. M.

*Series C—Test I*

1. I dictated the words to the class and had the papers collected immediately.
2. (a) I had the slips containing the list of words passed to the pupils with the words turned down. At a given signal the pupils turned the slips.  
(b) I pronounced the first word.  
(c) The pupils pronounced and spelled the first word in concert.  
(d) The pupils pronounced and spelled the word in concert two times, making three continuous repetitions of each word.
3. I had the pupils study each succeeding word in the list in the same way the first was studied, completing the list.
4. I pronounced the words to the class immediately after the completion of the list and collected the papers, suggesting to the class that they should forget all about these words.

*Test II*

1. I dictated the words to class and had papers collected immediately.
2. (a) I had the slips containing the words passed to the pupils with the words turned down. At a given signal the pupils turned the slips.  
(b) I pronounced the first word.  
(c) The pupils pronounced and spelled the first word in concert.  
(d) The pupils completed the list pronouncing and spelling each word in concert once, then the entire list was repeated in the same way two times, making three repetitions, each repetition after an interval of time equal to the time required to study 19 words.
3. I pronounced the words to class immediately after the completion of list and collected the papers, suggesting to the class that they should forget all about these words.

*Test III*

1. I dictated the words to class and had papers collected immediately.
2. (a) I had the slips containing the words passed to the pupils with the words turned down. At a given signal the pupils turned the slips.  
(b) I pronounced the first word.  
(c) The pupils pronounced and spelled the first word in concert.  
(d) I had the pupils pronounce and spell the first word the second time, then completed the list in the same way, making two continuous repetitions for each word.  
(e) After the list was completed I had the pupils pronounce and spell in concert each word in the list, thus making a total of three repetitions—two continuous and one after an interval.
3. I pronounced the words to the class immediately after the completion of list and collected the papers, suggesting to the class that they should forget all about these words.

The following list of words was used in Series C.

## GRADE V

TEST 1	TEST 2	TEST 3
1. daily	1. gentian	1. precipice
2. multiple	2. economy	2. analysis
3. telescope	3. gorgeous	3. cistern
4. citizen	4. chocolate	4. delicious
5. sociable	5. poisonous	5. parenthesis
6. grandeur	6. experiment	6. fowl
7. perspiration	7. ravine	7. policy
8. antennae	8. damaged	8. major
9. naturalist	9. punctual	9. cottage
10. planets	10. especially	10. luscious

11. decimal	11. recruits	11. mucilage
12. residence	12. rapidity	12. volcanic
13. chamois	13. declarative	13. obstacles
14. favorite	14. cavern	14. microscope
15. government	15. magistrate	15. encouraged
16. crayon	16. apparatus	16. desirable
17. telephone	17. fatigued	17. enlarged
18. conjunction	18. imagine	18. haughty
19. oxygen	19. hazardous	19. ignorant
20. luncheon	20. neighbor	20. mortgage

## GRADE VI

TEST 1	TEST 2	TEST 3
1. console	1. astral	1. divisible
2. furious	2. aroma	2. trellis
3. constable	3. asphalt	3. stalwart
4. grocery	4. privily	4. ruinous
5. interment	5. guidance	5. reverently
6. excessive	6. sumptuously	6. hydrant
7. excellence	7. exhaust	7. lyceum
8. humid	8. trespass	8. critical
9. lunacy	9. revengeful	9. wrongfully
10. disastrous	10. continual	10. morgue
11. missionary	11. woolen	11. hyena
12. spigot	12. briery	12. duodenum
13. reunite	13. copying	13. stature
14. molasses	14. spiral	14. stampede
15. prepositional	15. arsenal	15. rivalry
16. motor	16. lymphatics	16. exhibitor
17. privacy	17. exclusive	17. cornice
18. preference	18. suitor	18. ridiculous
19. preparatory	19. volunteer	19. intimately
20. contemptible	20. vulgarity	20. suggestion

## GRADE VII

TEST 1	TEST 2	TEST 3
1. paradise	1. specify	1. penury
2. chemistry	2. cosmetic	2. bronchial
3. metropolis	3. burlesque	3. athletic
4. auditor	4. auxiliaries	4. auctioneer
5. hypocrite	5. transom	5. minaret
6. nectarine	6. futurity	6. ferocious
7. adjournment	7. periodical	7. arsenal
8. accurate	8. cravat	8. treason
9. groceries	9. mystical	9. triennial
10. penetrable	10. pulmonary	10. negotiable
11. devastate	11. unerring	11. fatigue
12. whimsical	12. cremation	12. guidance
13. discernible	13. criticise	13. avalanche
14. mattress	14. etiquette	14. brokerage
15. pungency	15. coupon	15. cogent
16. republican	16. doctrine	16. neighborly
17. continuous	17. indicative	17. consciousness
18. infinite	18. subtle	18. suture
19. typhoon	19. methodist	19. avarice
20. neuralgia	20. solicitor	20. tragical

## GRADE VIII

TEST 1	TEST 2	TEST 3
1. clemency	1. sophomore	1. dynasty
2. codicil	2. petrification	2. supersede
3. amalgam	3. architecture	3. frigidity
4. soprano	4. annihilation	4. conscientious
5. prestige	5. albatross	5. coquette
6. chorister	6. ineligible	6. prejudice
7. sovereign	7. munificence	7. philosopher
8. piquancy	8. equitable	8. inexplicable
9. cellular	9. postilion	9. mystify
10. recreant	10. ambiguity	10. severance



11. rigidity	11. villain	11. husbandry
12. chevalier	12. cochineal	12. amphibious
13. tournament	13. coherency	13. volatile
14. reminiscence	14. miscellaneous	14. monetary
15. extraordinary	15. cogitate	15. concentric
16. monotonous	16. renewable	16. polysyllable
17. substantially	17. perspicuity	17. tricycle
18. democracy	18. dynamite	18. collision
19. honorary	19. temporal	19. intestinal
20. apologize	20. artesian	20. requisition

TABLE XX

*Showing the Number and Percentage of Words Learned Immediately After Study*

SERIES C—TEST I—Three oral repetitions—Continuous.

	Number of Pupils	Number of Words Missed Before Study	Number of Words Missed After Study	Number of Words Learned	Percentage Learned
Grade V.....	22	277	163	114	41.2
Grade VI.....	25	250	141	109	43.6
Grade VII.....	32	370	164	206	55.7
Grade VIII.....	24	339	204	135	39.8

TEST 2—Three oral repetitions—Two repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Grade V.....	22	339	168	171	50.5
Grade VI.....	25	293	102	191	65.2
Grade VII.....	32	419	147	272	64.9
Grade VIII.....	24	314	102	212	67.5

TEST 3—Three oral repetitions—Two continuous and one after an interval the length of which was the time required to complete the list twice.

Grade V.....	22	301	151	150	49.8
Grade VI.....	25	344	168	176	51.1
Grade VII.....	32	402	149	253	62.9
Grade VIII.....	24	329	123	206	62.2

The weather was fair or clear for all tests, excepting Grade V, Test II—a very cold, stormy day, and Grade VIII, Test III—a large number of pupils had been on a sleighing party the night before.

Time approximately the same in all tests.

TABLE XXI

*Showing the Number and Percentage of Words Learned at End of Week*

SERIES C—TEST 1—Three oral repetitions—Continuous.

	Number of Pupils	Number of Words Missed Before Study	Number of Words Missed at End of Week	Number of Words Learned at End of Week	Percentage Learned at End of Week
Grade V.....	22	277	234	43	18.4
Grade VI.....	25	250	176	74	29.6
Grade VII.....	32	370	199	171	46.2
Grade VIII.....	24	339	245	94	27.7

TEST 2—Three oral repetitions—Two repetitions, each of which was after an interval the length of which was the time required to study the other words of the list.

Grade V.....	22	339	254	85	25.1
Grade VI.....	25	293	172	121	41.3
Grade VII.....	32	419	183	236	56.3
Grade VIII.....	24	314	168	146	46.5

TEST 3—Three oral repetitions—Two continuous and one after an interval the length of which was the time required to complete the list twice.

Grade V.....	22	301	231	70	23.2
Grade VI.....	25	344	216	128	37.2
Grade VII.....	32	402	188	214	53.2
Grade VIII.....	24	329	197	132	40.1

Weather and time conditions same as previously noted.

TABLE XXII

*Showing the Average Number and Percentage of Words Learned After Study*

SERIES C—TEST 1—Three oral repetitions—Continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number of Words Missed After Study	Average Number of Words Learned	Percentage Learned
Grade V.....	22	12.6	7.4	5.2	41.2
Grade VI.....	25	10.	5.6	4.4	43.6
Grade VII.....	32	11.6	5.1	6.5	55.7
Grade VIII.....	24	14.1	8.5	5.6	39.8

TEST 2—Three oral repetitions—Two repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Grade V.....	22	15.4	7.6	7.8	50.5
Grade VI.....	25	11.7	4.1	7.6	65.2
Grade VII.....	32	13.1	4.6	8.5	64.9
Grade VIII.....	24	13.	4.3	8.7	67.5

TEST 3—Three oral repetitions—Two continuous and one after an interval the length of which was the time required to complete the list twice.

Grade V.....	22	13.7	6.9	6.8	49.8
Grade VI.....	25	13.8	6.7	7.1	51.1
Grade VII.....	32	12.6	4.7	7.9	62.9
Grade VIII.....	24	13.7	5.1	8.6	62.2

Weather and time conditions same as previously noted.

TABLE XXIII

*Showing the Average Number and Percentage of Words Learned at End of Week*

SERIES C—TEST 1—Three oral repetitions—Continuous.

	Number of Pupils	Average Number of Words Missed Before Study	Average Number of Words Missed at End of Week	Average Number of Words Learned at End of Week	Percentage Learned at End of Week
Grade V.....	22	12.6	10.6	2.	18.4
Grade VI.....	25	10.	7.	3.	29.6
Grade VII.....	32	11.6	6.2	5.4	46.2
Grade VIII.....	24	14.1	10.2	3.9	27.7

TEST 2—Three oral repetitions—Two repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Grade V.....	22	15.4	11.5	3.9	25.1
Grade VI.....	25	11.7	6.9	4.8	41.3
Grade VII.....	32	13.1	5.8	7.3	56.3
Grade VIII.....	24	13.	7.	6.	46.5

TEST 3—Three oral repetitions—Two continuous and one after an interval the length of which was the time required to complete the list twice.

Grade V.....	22	13.7	10.5	3.2	23.2
Grade VI.....	25	13.8	8.6	7.1	37.2
Grade VII.....	32	12.6	5.9	6.7	53.2
Grade VIII.....	24	13.7	8.2	5.5	40.1

Weather and time conditions same as previously noted.

TABLE XXIV

*Comparison of Percentage Learned and Retained*

SERIES C—TEST 1—Three oral repetitions—Continuous.

	Number of Pupils	Percentage of Words Learned	Percentage of Words Retained at End of Week
Grade V.....	22	41.2	18.4
Grade VI.....	25	43.6	29.6
Grade VII.....	32	55.7	46.2
Grade VIII.....	24	39.8	27.7
Average.....	..	45.7	40.6

TEST 2—Three oral repetitions—Two repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Grade V.....	22	50.5	25.1
Grade VI.....	25	65.2	41.3
Grade VII.....	32	64.9	56.3
Grade VIII.....	24	67.5	46.5
Average.....	..	62.	42.3

TEST 3—Three oral repetitions—Two continuous and one after an interval the length of which was the time required to complete the list twice.

Grade V.....	22	49.8	23.2
Grade VI.....	25	51.1	37.2
Grade VII.....	32	62.9	53.2
Grade VIII.....	24	62.2	40.1
Average.....	..	56.5	38.4

*Analysis Series C—Test 1, 2, 3*

Examination of results shows that Grades 5, 6, 7, and 8, all grades in which the tests were made, learned the highest percentage of words in Test 2, the characteristic of which was three repetitions each after an interval. The same is true at the end of the week. The average per cent learned in Test 1 was 45.7 per cent, in Test 2 62 per cent, making a difference of 17.7 per cent. in favor of Test 2, the characteristic of which was repetition after an interval. At the end of the week there was a difference of 2.3 per cent in favor of Test 2. In comparison of Test 1 and Test 3 the higher percentage was learned in Test 3, 9.6 per cent in favor of Test 3. At the end of the week the advantage was 5.2 in favor of Test 3. Without exception the advantage was in favor of repetition after an interval in Experiment III.

This experiment shows, as did Experiment II, that both in immediate results and in results at end of the week repetition after an interval is more effective in memorizing in spelling than continuous repetition.

## PART IV

### EXPERIMENT IV

The object of this brief experiment was the same as in previous experiments.

During Experiment III, I felt sure that there was a possible error that would need correction. First, the element of guessing was present in all the tests. Pupils would frequently miss words after study that they did not miss in the preliminary tests, showing that they guessed at the correct spelling in the preliminary test.

The second error seemed to be present because in study all pupils were required to study the same words, thus studying the words that they seemed to know in the preliminary test and the words they did not know. In order to eliminate these two possible errors, as far as possible, the following individual tests were given.

#### *Plan of Test*

1. Ten pupils were selected from grades 5, 6, 7 and 8. The selection was made so that the pupils were of the same general intelligence.

2. Each pupil was tested separately. Twenty-five words were pronounced to the pupil. The pupil's paper was taken and a list of the words missed was written on the typewriter in the same form as the slips had been printed in Experiment III. Then the pupil was directed to study aloud, these words, all of which they had missed, in the presence of the experimenter in the same way as all of the words had been studied in Series C—Tests 1, 2, 3.

3. This experiment was conducted in all respects like Experiment III, excepting that there was one pupil in each case, instead of a number of pupils.

TABLE XXV

The following results were obtained:

*Individual Experiment*

TEST 1—Three oral repetitions—continuous.

Subject	Number of Words in Test	Number Missed After Study	Number Learned After Study	Percentage Learned
A.....	8	1	7	87.5
B.....	13	4	9	69.2
C.....	12	3	9	75.
D.....	12	8	4	33.3
E.....	16	8	8	50.
F.....	15	8	7	46.6
G.....	14	1	13	92.9
H.....	8	2	6	75.
I.....	6	2	4	66.6
J.....	10	5	5	50.
Average	11.4	4.2	7.2	64.6

TEST 2—Three oral repetitions—Two repetitions each of which was after an interval the length of which was the time required to study the other words of the list.

Subject	Number of Words in Test	Number Missed After Study	Number Learned After Study	Percentage Learned
A.....	9	0	9	100.
B.....	14	3	11	78.6
C.....	15	3	12	80.
D.....	13	0	13	100.
E.....	12	1	11	91.7
F.....	11	2	9	81.8
G.....	10	0	10	100.
H.....	6	1	5	83.3
I.....	7	1	6	85.7
J.....	11	1	10	90.9
Average	10.8	1.2	9.6	89.2

**TEST 3**—Three oral repetitions—Two continuous and one after an interval the length of which was the time required to complete the list twice.

A.....	13	1	12	92.3
B.....	16	5	11	68.8
C.....	12	5	7	58.3
D.....	13	4	9	69.2
E.....	16	6	10	62.5
F.....	11	7	4	36.4
G.....	13	2	11	84.6
H.....	8	2	6	75.
I.....	8	1	7	87.5
J.....	15	7	8	53.5
Average	12.5	4.	8.7	68.8

*Analysis of Result—Experiment IV*

In comparison of Tests 1 and 2 the larger percentage of words was learned in Test 2, three of the pupils learning all the words to be learned. The average number learned by the ten pupils is 64.6 per cent in Test 1, and 89.2 per cent in Test 2, making a difference of 24.6 per cent in favor of Test 2, the characteristic of which was repetition after an interval.

In comparison of Tests 1 and 3, the advantage is 4.2 per cent in favor of Test 3, although in individual cases, as pupils B, C, F, and G, the percentage learned is higher in Test 1. This brief experiment serves only to emphasize the conclusion of the previous experiments.

The higher percentage of words learned in experiment four was due to two chief reasons; first, the entire time of study was placed upon words that each pupil did not know; second, the pupils were selected pupils possessing ability of concentration somewhat above the average.



